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CLEAN AIR
AND ENVIRONMENTAL PROTECTION

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- Policies & Perspectives on Noise Control
- Environmental Protection 97
  Global Problems & Local Policies - NSCA President's Address
  Centre pull-out: NSCA Conference Report
- Air Pollution Episodes - London & Paris

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CONTENTS

The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

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NOISE

Making a Noise about Noise

Despite its image as something of a *cinderella* pollutant, there are few environmental problems which cause quite the same level of social conflict as that of noise pollution. Intrusion and annoyance all too often spill over into confrontation, aggression and direct physical violence. And, as we know, all too often it's the noise sufferer or an environmental health officer who bears the brunt. Almost a third of local authorities responding to a recent NSCA survey reported that their officers had been threatened with violence, and 5% had actually been attacked, whilst dealing with noise complaints last year.

Other impacts of noise are perhaps less dramatic but none the less equally worrying. Although the medical evidence on the acute health effects remains equivocal, there is good evidence that environmental noise is a stressor which interferes with sleep and cognitive performance, and which damages reading comprehension and memory in children.

With local authorities recording a record 164,000 noise complaints with the CIEH in 1995/96 - a 24% annual increase when calculated on a complaints per million basis - there is little to suggest that the current high level of social conflict and environmental degradation resulting from noise pollution is about to decline.

However, despite this bleak background of rapidly increasing noise complaints, there are signs that we may be entering a new more positive phase in the development of noise policy.

This themed issue of *Clean Air* therefore reviews a number of these developments. Some of which were first reported at the NSCA's September training seminar Noise Update 1997.

Following implementation of the *Noise Act 1996*, Patrick Williams of Southdowns Environmental reports the findings of the DETR's baseline survey of local authorities handling and resolution of domestic noise complaints. One of a series of studies which will underpin the Department's review of the 1996 Act in two years' time.

Robert Heathcock of Winchester City Council provides a rather different slant on the development of local authority noise services, which advocates a more pro-active customer orientated approach. At Winchester, imagination, flexibility and good management have actually resulted in a decrease in noise complaints to the authority.

Angela Eagle MP, the Under-Secretary of State with the DETR, makes it clear that noise issues will form an important consideration in the development of the new Government's integrated transport policy - an area where the UK's record bears poor comparison with many of our more progressive European partners. The Minister also provides a useful update on the DETR's noise research programme. This includes further details of the new DETR/DoH joint research initiative into the effects of noise on health, announced at Noise Update 1997.

Finally, the NSCA's Policy Officer Dr Malcolm Eames reviews the drivers pushing environmental noise up the policy agenda, both here in the UK and across the European Union as a whole. In so doing he draws particular attention to the possible synergies with local air quality management; the potential of noise mapping to provide a more effective basis for policy; industrial noise and IPPC; and the need for effective action on transport noise.

UK Priorities for Noise Policy

Angela Eagle MP
Parliamentary Under Secretary of State
Department of the Environment,
Transport & the Regions

This paper, presented at NSCA's Noise Update Seminar held in September, focusses on environmental noise; broadly that is noise other than in the workplace. It explains the Government's objectives with regard to environmental noise and looks in particular at two issues, transport noise and neighbour noise.

We have all experienced the intrusiveness of noise. It is a feature of modern life that is all too difficult to avoid. I know only too well from my own constituency advice surgeries and the postbag that noise is a source of great annoyance and frustration to many people.

Noise, the researchers tell us, is not generally a life and death issue. But it is, most definitely, a quality of life issue. A national noise attitude survey conducted in 1991 suggested that one in three people considered that environmental noise spoiled their home life to some extent. One per cent said their home life was totally spoiled by noise. We should be listening to these real concerns seriously.

We know that excessive and prolonged noise can damage hearing. But this is usually an occupational or recreational problem. Environmental noise is seldom loud enough to damage your hearing. But there is evidence that in addition to annoyance, noise at lower levels can give rise to a range of mental and physical effects as a result of interruption of sleep and concentration. In the long term this might lead to stress related illnesses and cardiovascular problems. It certainly causes misery and anxiety. This means we should try to avoid increases in environmental noise wherever possible, and take active measures to reduce existing noise levels where they are disrupting people's lives.

The Government's overall objective is therefore to promote and encourage current measures and new initiatives to reduce the proportion of the population experiencing excessive noise. We must aim to improve the quality of the local environment and to minimise health risks posed by environmental noise. To achieve these aims, we will continue to promote and encourage the broadest range of measures and initiatives to reduce noise at source and increase the effectiveness of remedies for noise problems.

The Government plays a key role - first in quantifying and assessing noise problems; second encouraging, by regulation, guidance and other means, the reduction of noise at source; and third enabling the provision of effective remedies for noise sufferers.

For most people, noise is the most immediate and most widely experienced negative impact of transport. Studies carried out on our behalf by the Building Research Establishment in the early 1990s showed road traffic noise was noticeable at over 90% of the 1,000 sites in England and Wales where noise measurements were made. Aircraft noise was heard at over 60% of sites and railway noise was heard at over 15% of the sites. Although road traffic noise is heard by many more people than any other source of noise, a relatively small proportion of complaints focus on it. Many more people complain about noisy neighbours. We might conclude from this that people find noisy neighbours more of a nuisance than noisy traffic. But this ignores the fact that noisy neighbours can be identified, and so - either directly or through their local authority - people may be able to get the noise stopped. On the other hand, the anonymity of the source of traffic noise may discourage complaints.

I have mentioned two surveys which were undertaken in the early 1990s. One looked at attitudes to environmental noise and the other the incidence and types of environmental noise. Clearly we need to know whether the situation has changed, especially given the continuing growth in road traffic and the inexorable growth in complaints of neighbour noise. My Department is therefore about to commission new surveys funded from our noise research programme. The aim is to get a better picture of trends in the noise climate and attitudes to it.

We also recognise the need to take seriously the proposition that in the longer term a noisy environment may have adverse effects on health. We have been working closely with colleagues in the Department of Health on this question. In May, my Department, together with the Department of Health, sponsored a working group of experts - from this country and abroad - in the field of health effects of environmental noise. They concluded that exposure to environmental noise can be a source of annoyance and can lead to sleep disturbance in some people. Experts are concerned about the possible health effects of environmental noise but there is no clear cut evidence either proving direct long term effects, or discounting them. This expert group recommended further

research work was needed. In the light of this, my Department and the Department of Health are planning to undertake a joint programme of research to explore further the possible links between health and environmental noise. Our intention is to earmark around £600,000 of the two Departments' research budgets over the next three years. We are still finalising the arrangements but we hope to be seeking expressions of interest from potential researchers later in the year.

You may be familiar with the projection of a 4.4 million increase in households by the year 2016. This Government, like the last, is committed to creating as many homes as possible in urban areas, to protect the countryside from further erosion. But most available urban brown field sites were formerly industrial or commercial premises. They were often built close to rail corridors, main roads, airports and other noisy areas. Shutting out the noise with double glazing often means shutting out the fresh air and worsening indoor air quality. In the long term it will make more sense to improve the attractiveness of our towns and cities, and to tackle the local environmental problems, rather than to try and shut noise out by turning homes into fortresses against the outside world. This represents a major challenge in both design and build.

Transport Noise

The first opportunity to deal with noise problems is often at the planning stage. All major road, rail and airport proposals are subject to environmental impact assessments. Noise will be one of the major considerations. And there are plenty of examples where partnership of action between central and local government, and industry is bringing real benefits in terms of preventing and reducing transport noise at source.

Action at national and European level to reduce noise from road vehicles has been very successful. It has been a significant factor in ensuring that, in spite of the growth in traffic volume, there was no overall increase in noise levels in England and Wales between the major national surveys of noise exposure carried out in 1972 and 1990. We cannot, however, rely on further reductions in engine noise to balance further traffic growth and thus ensure a stable noise climate. The manufacturers tell us that they are approaching the limit of what the technology will allow, without making major shifts to new, quieter forms of propulsion. This makes it especially important to continue to develop other measures to prevent noise problems.

As further reductions in engine noise become difficult, attention has shifted to the noise generated at the interface of tyres and road surfaces. Already at speeds over 30 mph road surface noise exceeds engine noise in most cases. The Government is taking forward further research in this area. However, there seems to be considerable scope for sharing experience with other countries to help us make progress here.

There has also been encouraging progress nationally in reducing railway noise, through the introduction of electric locomotives and lighter, and therefore quieter, freight wagons. The greater use of continuously welded rail also has significant environmental benefits for those living near railway lines. Railway noise insulation regulations introduced in 1995 place a duty on railway authorities to offer insulation when noise from new or substantially altered railway lines exceeds specific levels. These regulations are designed to offer equity of treatment between people living near new railway lines and people living near new roads, who have enjoyed the benefit of similar regulations since 1973.

Many people prefer noise barriers to sound insulation of their homes. Noise barriers are used increasingly as a means of controlling noise from both roads and railways. Effective barriers can bring greater community benefits than insulation by reducing ambient noise levels over a wide area. The Highways Agency has an ongoing programme of research into the performance and cost-effectiveness of different materials and designs of noise barrier.

Road bypasses, controversial as they may be, can improve the quality of life in many of our towns and villages. In many places local authorities can manage traffic by routing it around sensitive places like shopping and residential areas. Traffic calming techniques may have a part to play in this process. One of the objectives of integrated transport policies will be to ensure that steps to minimise noise, are included alongside those to control air pollution and improve road safety.

There is no single solution to the complexities of road and rail noise. Our aim will be to promote a range of options which are appropriate to different circumstances. These could include tighter vehicle specifications; there may also be scope for the use of economic instruments which might reflect the external environmental costs of transport.

I have not yet touched on aviation. The Government will continue a two pronged approach to controlling aircraft noise. First it is pressing, in the International Civil Aviation Organisation's Committee on Aviation Environmental Protection and other international fora, the case for more stringent controls. Secondly, it is using guidance on and regulation of the operational determinants of noise on the ground. A balance has to be struck between the interests of the airlines and their passengers and of those on the ground who have to live with aircraft noise. Many of you will be familiar with the Munich airport study which showed that aircraft noise can have an effect on children's cognitive development. The recent *New Scientist* report on JFK airport added to these findings. The Government is studying this research, and will consider commissioning further research should this be necessary.

This Government, however, is responding to calls from business and the public for stronger action to reduce the environmental impacts of transport and for more effective measures to reduce congestion. There is growing demand for improvements in the quality of life. This has resulted in calls for policies to reduce the growth of road traffic, especially if this can be achieved without compromising economic growth. Such policies are most likely to be effected where congestion is worst.

Sustainable transport policy involves addressing the need for access to services while at the same time meeting the requirements of social and environmental protection. The Government believes that the best way of reconciling these competing objectives is through an integrated transport policy, and on 5 June the Deputy Prime Minister announced that he was launching a fundamental review of transport policy to achieve that. The intention is to publish a White Paper in Spring 1998 which addresses the issues raised both by the key transport modes and by their interactions with the wider economy and the environment. The Government is quite clear that to be successful, transport policy has to be integrated, not just at a national level, but also at a local and regional level.

Neighbour Noise

I have concentrated so far on transport noise, but as I said earlier, we know that people actually complain more about the noise made by their neighbours. Recently the Chartered Institute of Environmental Health published its latest statistics on domestic noise complaints. These showed a 24% increase in 1995-96 compared to the previous year. I am not sure that I agree with the Chartered Institute's conclusion that the increase is due to unrealistic expectations of the noise climate. Just because so few complaints actually result in cases being taken to court does not mean that complaints are not justified. This is another area where further work is needed. I hope that the research work which we are commissioning will begin to shed some light on the issue of complaints and their resolution.

It is perhaps only in the last few years that the importance of tackling neighbour noise has been appreciated, as the level of complaints has been rising. There was a clear need for improved guidance. In February 1997, the CIEH issued its Good Practice Guidance for the management of noise management policies and practices. Separately they issued jointly with the Association of Chief Police Officers, a good practice guide on police/local authority co-operation.

Noise Act 1996

We have also seen the implementation of the *Noise Act 1996*. This clarified the law on confiscating equipment used in a noise offence and introduced a new offence of making excessive noise at night from domestic premises. On the first of these, I understand authorities have been making good use of the powers since they were made available almost a year ago. On the new offence, there has been much debate about the low number of authorities which are planning to adopt it.

The Department had always assumed that take-up would be gradual and that many authorities would take the view that it was not appropriate to their area. We have emphasised that this is very much an additional weapon in the fight against the noisy neighbour. Having an objective standard is a novel approach to this difficult area. We have therefore undertaken to review the workings and take up of the offence in two years time. We aim not only to look at how the new offence has been working in practice, but also how, in the meantime, local authorities have been developing their services. I suggest that the real performance indicator is whether people are getting a better noise service and are getting their valid complaints about noise effectively dealt with. The Noise Act may prove an invaluable weapon in some circumstances.

Anti-Social Behaviour

We are also committed to tackling anti-social behaviour more generally. We plan to introduce new legislation in the Crime and Disorder Bill to tackle threatening and criminal behaviour by neighbours. Included amongst these powers will be the introduction of "Community Safety Orders". These powers will enable local authorities, along with the police, to apply to the Courts for an Order restricting the behaviour of individuals who engage in the sort of disorderly behaviour that can, if unchecked, lead to worse and increasing crime. An Order will be addressed to a named individual and focus on specific behaviour that has caused innocent people distress or fear. I could give you plenty of examples of that - it is all too common these days.

My Department is continuing to implement the outstanding parts of the *Housing Act 1996* which concern anti-social behaviour in the limited context of social housing. New powers for local authorities to seek injunctions to combat nuisance by non-tenants and visitors to an estate came into force on 1 September 1997. One of the effects of these new powers will be to make it possible for a power of arrest to be attached to those injunctions and to injunctions taken out against tenants who breach their tenancy agreements, where violence has occurred or has been threatened. Although these powers are focussed on anti-social behaviour, they are clearly of great relevance where noise is part of the problem and where neighbours are intimidated or threatened. Again, the two often go hand in hand.

EC Green Paper

I should also mention briefly the recent European Green Paper on the future of noise policy. The UK has welcomed warmly the recent opportunity to participate in a wider debate about environmental noise and its effects. We also welcomed the Commission's proposal to assess the costs and benefits of a combination of instruments to reduce

noise from road, rail and air. And we acknowledge the Community's traditional and successful role in reducing noise emissions from vehicles, equipment and machinery. However there were concerns about the potential costs and benefits in this area.

The Government agrees that more work is required in terms of research and exchange of information. We look forward to participating fully in discussions of the technical feasibility, and costs and benefits of further reductions in road vehicle engine noise levels, and the consideration of proposals for reducing noise at the road surface. However, as with our own domestic research, we would need to be reassured that any proposals for noise reduction from this source would not be at the expense of road safety.

While the UK Government recognises the benefits of developing a mix of noise reduction measures when regulating modes of transport, this has to be balanced against its impact on the cost of railway travel in particular. It would be a mistake, clearly, to discourage greater use of railways which are less polluting and more efficient, in many instances, than road transport.

Technological innovation will be a help but not a panacea in dealing with noise and other transport related environmental problems. Equally important will be concerted action by key players. Central and local government should seek to regulate and facilitate but are less likely to fund. The construction and manufacturing industry and the private sector generally is increasingly likely to provide the infrastructure. Business in general, which needs access to efficient transport systems, will need to look at ways of greening its transport use to reduce environmental impacts. And most important of course is the public. They are major users, but also potential sufferers. Their behaviour and choices will dictate the shape of the balance to be struck. And if policy makers and practitioners get the balance wrong the users and sufferers will make that clear - however much we think we are the experts.

Conclusion

I should not forget our hosts today, the National Society for Clean Air and Environmental Protection. We value the work of the Society and we grant aid the work of its Information Service which provides invaluable advice and help. We also provided some financial support to enable the information pack on Noise Awareness Day to be produced and dispatched by the Society.

I have tried to set out the context in which the Government will be developing its policies on noise. At the end of the day this Government will be faced, like all those before it, with the limitations of technological fixes; with the high cost of physical amelioration; and with the growing public demand for action. Ministers are alert to the issue and its importance. The debate which will follow here today, and similar debates elsewhere; the decisions taken in the EC and in other international fora; and the importance the public attach to noise control will all be useful contributions.

Future Research on Environmental Noise being undertaken by the DETR

The Department of the Environment, Transport and the Regions (DETR) has been reviewing its research programme on environmental noise and some key new projects are about to start (see below).

Commenting on the new projects, Environment Minister, Angela Eagle said: "since my speech at the National Society for Clean Air seminar on 16 September, I am happy to say that our programme of research on environmental noise is now actively being taken forward. A number of projects are planned for the coming months which will inform our decision making in a number of noise policy areas. In particular, we are piloting two projects on noise incidence and awareness which will lead to more extensive work in 1998-99. Our joint project with the Department of Health on the effects of noise on health is also beginning to take shape".

Noise Standards

At present the UK Government has not set targets in relation to environmental noise, although the issue of differing noise exposure is recognised in planning guidance (PPG No. 24). A number of organisations, including the World Health Organisation, the European Commission and the Royal Commission on Environmental Pollution have suggested targets in relation to various types of environmental noise, i.e. noise other than occupational or leisure noise.

As part of its consideration of how policy might develop in this area, DETR plans to explore the idea of effects-based standards for exposure to environmental noise and will shortly be letting a research contract for completion within the financial year.

The project will consider existing information and look at noise levels that may have particular effects on the population. The aim is to investigate the feasibility of establishing effects-based standards which might be used to inform the setting of objectives and targets. The analysis will consider whether effects-based standards could be established but will not take into account the practicability of delivering such standards.

The detailed work will consider at which noise levels there is a reported effect on a range of criteria. These will include: temporary hearing loss, conversation disruption,

concentration diversion and sleep disturbance/awakening. The review will also consider whether different sound levels are appropriate for different types of noise, as well as how noise levels might be applied to degrees of annoyance. Factors accounting for responses to intermittent or continuous noises and to the tonal qualities of the noise will also be taken into account.

Noise Incidence Survey

In 1990-91, the Department funded a noise incidence survey to establish the noise climate outside homes in England and Wales. The noise environment was measured for a 24 hour period outside each of 1,000 sites chosen to be representative of the population. Building Research Establishment (BRE) Information Paper IP 21/93 summarised the findings of this survey.

The Department has decided to repeat this work through a new National Noise Incidence Survey to be undertaken during 1998-99. A key aim is to enable comparisons to be made with the previous survey to determine whether the noise climate has significantly changed over the past few years.

Before the National Incidence Survey is commenced, a pilot study will be carried out. This pilot study will be used to determine whether the full survey should use the same measurement sites as before, the same site methodology but different sites, or a modified methodology based on revised objectives. The study will also review advances in instrumentation since the 1990-91 survey and advise on the appropriate criteria and the type of measurements to be made.

The pilot report will then review the lessons learnt and indicate the most appropriate way forward for the main survey.

Noise Awareness Survey

The Department funded a noise awareness survey in England and Wales in 1990-91 to establish the effect of environmental noise on people in their homes. The initial research, based on group discussions, had two aims:

- to establish how people at home react to environmental noise, and
- to understand precisely what people mean when they describe their reactions to noise.

The findings were then used to design a questionnaire for a national survey of attitudes to noise. BRE Information Paper IP 22/93 summarised the findings of this work. This work is to be repeated through a new national Noise Awareness Survey to be carried out in 1998-99. Again the aim is to compare the present situation with the previous work.

Before the National Awareness Survey is carried out there will be a preview study of the questionnaire. The detailed work will involve a review of the questionnaire used in the 1990-91 survey and the findings of a subsequent social survey in 1992. In order to decide whether any amendments to the questionnaire are necessary, there will be a number of focus group discussions. The findings of the group discussions will be used to inform the content and design of the new questionnaire which will be used in the national survey. Care will be taken to ensure that there is sufficient commonality with the 1990-91 national survey to permit meaningful comparisons between surveys.

A further reason for piloting both the Incidence and Awareness studies is to explore the potential for linking the results of the future national surveys. This could yield valuable insights into attitudes to noise at particular levels.

BRE has been engaged as the Department's contractors on the pilot study for the Noise Incidence survey and the preview study for the Noise Awareness study. They are expected to report to the Department before April 1998. The contracts for the National Noise Incidence survey and the Noise Awareness survey will be let by the Department in 1998-99.

Survey of Local Authority Noise Surveys

Over recent years there have been a number of surveys into the provision of noise services by local authorities and their effectiveness. Apart from the annual Chartered Institute of Environmental Health (CIEH) postal survey and the recent NSCA postal survey, the Department itself has commissioned two research projects - one by BRE to examine resolution of domestic noise complaints, and the other by Southdowns Environmental Ltd which provided baseline information for a future review of the take up of the new night noise offence (see separate article in this *Clean Air*). However, these surveys have each used different questionnaires and methodologies and enjoyed differing response rates.

The Department therefore intends to let a research contract, for completion within this financial year, that will review these four surveys. The aim is to establish the common features and areas and where they diverge. The work will then go on to consider how surveys of local authority noise services might be better undertaken in future, bearing in mind the desirability for comparability with existing data and the Government commitment to review the provisions of the night noise offence in 1999-2000,

Audible Intruder Alarms

Since 1982, the *Code of Practice on Noise from Audible Intruder Alarms* has provided guidance on the installation and operation of alarms to minimise misfiring and to facilitate their disarming with the minimum of difficulty. Where alarms misfire and the keyholder cannot be contracted, local authorities in England can use Statutory Nuisance powers in Part IV of the *Environmental*

Protection Act 1990 to deal with the resulting nuisance. Under the *London Local Authorities Act 1991*, London Boroughs can adopt a free-standing set of provisions. Similar provisions exist for other local authorities in the *Noise and Statutory Nuisance Act 1993*, but these have not so far been brought into effect.

The Department intends to let a research contract, for completion by April 1998, that will consider the advantages and disadvantages of the legislation available to London Boroughs compared to authorities outside London. The project will then look at the benefits and drawbacks of commencing the powers contained in the *Noise and Statutory Nuisance Act 1993* and suggest possible options for a new statutory or non-statutory approach to the problem.

Links with Health

DETR, in conjunction with the Department of Health, will be undertaking a joint research programme to look at links between environmental noise and effects on health other than hearing. The two Departments have committed £600k over three years for this programme. Calls for research proposals are expected to be invited before Christmas with a view to the work commencing next Spring.

Conclusion

Excessive noise undoubtedly affects the quality of many people's lives, and may even affect their heath. The focus of the DETR's research programme is to consolidate areas where action has already taken place and, more importantly, to provide new insights into the noise climate and its effects on the population. Some of the work will bear fruit quickly, whilst other work is longer term. But the message is clear: noise plays an unwelcome role in many people's lives and public unease is increasing. The DETR's research programme will help to better understanding of the causes and extent of these concerns and provide better information on which to base future decisions.

DETR National Survey of Domestic Noise Complaints Received and Dealt with by Local Authorities in England and Wales During 1996

Patrick Williams
Southdowns Environmental Consultants Limited

Southdowns Environmental Consultants Limited (SEC) was commissioned in early 1997 by the Secretary of the State for the Environment to undertake a postal survey of noise complaints received by local authorities in England and Wales. The results of this survey were required by the DOE (now Department of the Environment, Transport and the Regions - DETR) to provide a basis for the establishment of baseline data on the handling and resolution of domestic noise complaints received during April to September 1996. A summary of the main results and findings of this study are presented in this paper.

Introduction

The Private Member's Bill introduced by Harry Greenway in December 1995 received Royal Assent on 18 July 1996 as the *Noise Act 1996*. Clarified powers relating to the confiscation and forfeiture of noise making equipment in cases of statutory noise nuisance came into force on 19 September 1996 under the Act. A new night noise offence and associated power of confiscation were also included as part of the *Noise Act* and originally scheduled to become available for adoption by local authorities in early 1997.

A commitment to review the take up and workings of the night noise offence two years after its implementation was made during the Parliamentary stages of the *Noise Act* and a five phase programme of related research was subsequently identified by the DOE. The five elements of the original programme planned for completion over the next five years are summarised below.

- *Phase I: 1997 to 1998* - the establishment of baseline data on the handling and resolution of domestic noise complaints made to local authorities in England and Wales during the six month period April to September 1996 prior to the implementation of the *Noise Act*.
- *Phase II: 1997 to 1998* - the establishment of base data to support the Health of the Nation proposed target to increase the proportion of complaints satisfactorily resolved, including visits to complainants and local authorities.
- *Phase III: 1998 to 1999* - the development of a questionnaire as part of a review of the take up of the night noise offence.
- *Phase IV: 1999 to 2000* - research into the take up of the night noise offence based on questionnaires and visits to selected local authorities; and
- *Phase V: 2000 to 2001* - research into the satisfactory resolution of domestic noise complaints based on 1996

baseline information and visits to complainants and local authorities.

The scope of the questionnaire required under Phase I of this work covered: services provided for the receipt, handling and resolution of domestic noise complaints; the number and nature of domestic noise complaints; and the number of domestic noise complaints formally and informally resolved.

Development and Circulation of the Main Questionnaire

A pilot questionnaire was prepared and circulated to ten local authorities following discussions with officers from three local authorities, the DOE, NSCA, the Chartered Institute of Environmental Health and the National Physical Laboratory. A draft pilot questionnaire was also submitted to the DOE's Survey Control Team for comment and approval. The comments and feedback thus obtained were, where appropriate, incorporated into the main questionnaire.

Part A of the questionnaire dealt with information of a general nature, whilst more specific information on the handling and resolution of domestic noise complaints was sought in Parts B and C respectively. Detailed data based on the permutation of parameters (type, number and time) were sought in Part D. The sub-categories of the main parameters (formal/informal remedy and source of complaint) were based on the latest CIEH classifications for local authority noise complaints. The scope and detail of questions was naturally constrained by the availability and form of data already compiled by local authorities in England and Wales for the year 1996. Local authorities were therefore invited to provide estimated numbers or percentages based on the integrated experiences of officers where detailed summary information on individual complaints was not available.

A personalised covering letter and the questionnaire were sent to the Chief Environmental Health Officers and Executives of the 378 local authorities in England and Wales identified in the 1997 *Municipal Yearbook*. The number of target and responding authorities are summarised in Table 1 according to type of authority.

Questionnaire Results

Incidence of Domestic Noise Complaints

One hundred and ninety-nine authorities provided a partial or complete response regarding the total number of all complaints received between April and September 1996 and the categorisation of these complaints according to source. Two of these authorities provided data for the complete 12 month period, 1996-97, and this information was included in the analysis after normalisation for the different time periods. The number of total complaints received by these authorities ranged from 28 to 8,109, with a mean value of 609 (n = 191) and a total value of 116,401.

An analysis of the information obtained for each category of noise source is presented in Table 2.

Analyses of the correlation between the number of domestic noise complaints received and local authority populations, land areas and/or population densities did not reveal any consistent overall effects across all the data received. The average number of domestic noise complaints received was however related to the type of authority as illustrated in Figure 1. This analysis indicates that 51% of all domestic noise complaints were dealt with by the London Borough, Metropolitan and Unitary Councils who accounted for just 25% of all respondents.

Domestic Noise Complaints by Type and Time of Occurrence

Interpretation of the classification of domestic noise complaints according to type, time of day and weekday/weekend period of occurrence was limited by the number of responses to Part D of the questionnaire. Many of the respondents indicated that this level of detailed information was not compiled over the six month period of interest.

The analysis of information received indicated however that noise from indoor music accounted for 35% of all domestic noise complaints and that just over half of these (55%) related to night-time disturbance. The majority of complaints about party noise (85%) was also attributed to night-time disturbance although this category of domestic noise complaint accounted for only a small proportion (6%) of all domestic noise complaints.

The results also indicated that the second major source of all domestic noise complaints involved noise from dogs and other animals. The majority of complaints in this category of domestic noise were attributed to weekday and weekend daytime incidences. Analysis of the complaints attributable to other categories of domestic noise source by type and time of occurrence indicates that the majority of complaints about noise from DIY, domestic equipment, off-street vehicular noise and gardening equipment were generated during daytime hours. No significant differences between the incidence of complaints at day or night due to alarms and other internal impulsive and airborne sources of domestic noise were evident.

Services Provided for Responding to Domestic Noise Complaints

The majority of respondents (91%) indicated that standard policies and procedures for responding to complaints were established. The target response times reported by 207 respondents are summarised in Figure 2 and indicate that a small majority (53%) of authorities aim to respond to all complaints within three days which falls inside the proposed response time of five working days contained in the Noise Management Guide (CIEH, 1997).

Wide variations in the out of hour services provided by local authorities were evident from the information provided and appeared to be independent of the number of domestic noise complaints received by the Metropolitan, Unitary and District Councils. The majority of services provided for the receipt of complaints were reactive rather than proactive, in accordance with current statutory duties of local authorities, although eight authorities reported the use of noise patrols for the identification of night-time noise disturbances at weekends. It was also evident from many of the qualified responses that out of hours complaints to local authorities were often screened by specialist personnel or other staff such as duty officers, and that not all complaints were directed to officers on-call or stand-by for immediate investigation. Where there was evidence of such screening, the out of hours service provided was classified under the generic heading of "emergency" services.

A summary of the services provided for responding to complaints according to the four different groups of local authority is presented in Figure 3.

One hundred and two (49%) of the 208 respondents indicated that 24-hour stand-by or on-call services were provided throughout the week and weekend periods for responding to certain or all domestic noise complaints received outside normal office hours. A further eight authorities indicated that 24-hour coverage was provided on Saturdays and Sundays whilst one other authority indicated that a 24-hour service was provided on Saturdays only.

Twenty-five authorities indicated that a limited out of hours stand-by service was provided on certain days over specified timebands. Analysis of the actual hours of service provided gave the following mean timebands for each day of the week:

- *Monday*: 18:30-01:30 (n=8)
- *Tuesday*: 18:30-01:30 (n=8)
- *Wednesday*: 18:30-01:30 (n=8)
- *Thursday*: 19:00-02:00 (n=9)
- *Friday*: 20:00-02:30 (n=18)
- *Saturday*: 20:30-02:30 (n=21)
- *Sunday*: 19:00-01:00 (n=9)

The Investigation and Resolution of Domestic Noise Complaints

The percentages of complaints investigated with a site visit ranged from 5 to 100%, with a mean value of 56% across local authorities and did not appear to be directly related to either the availability of officers on stand-by or the number of complaints received. The use of informal remedies provided the basis for the resolution of most domestic noise complaints with formal remedies being applied in just 5% of all cases of domestic noise complaint. This partially reflects the high mean percentage of complaints where nuisance was not confirmed (80%) and indicates that the majority (75%) of confirmed nuisances were also resolved informally. It should be noted however that the definition of resolution used by the majority of respondents was consistent with that recommended[1] in the CIEH Noise Management Guide (1997) and that high numbers of complaints considered to be resolved by local authorities may not reflect the number of complaints considered to be satisfactorily resolved.

The mean percentages of the underlying reasons for domestic noise complaints reported by 130 respondents indicated that 55% of all complaints were attributable to unreasonable behaviour. It is not possible however to conclude whether such behaviour was modified by informal remedy, assuming such behaviour constituted a nuisance, or whether in fact the local authorities options for formally addressing and dealing with the source of such complaint were exhausted. A proactive approach would be required to clarify this issue and to ensure that all domestic noise complaints were followed up after any initial response or course of action had been instigated by local authorities.

One hundred and twelve (91%) of the 123 respondents indicated that all complaints were resolved within a finite time scale whilst the remaining 11 respondents to this question indicated that, on average, 6% of all complaints remained unresolved. Several authorities also indicated that complaints were considered to be resolved if diaries or log sheets issued as a first response were not returned within 1-3 months of issue. The reported resolution times for each timeband are summarised and presented in Figure 4.

Summary of Main Findings

The results of this study provide a basis for the establishment of 1996 base data on the domestic noise complaints dealt with by a representative sample (n=208) of local authorities in England and Wales. The main findings are summarised below:

- domestic noise complaints accounted for 66% of all noise complaints received by local authorities in England and Wales during 1996;
- 51% of domestic noise complaints were received by the London, Metropolitan and Unitary Councils, who accounted for just 25% of all respondents;
- 28% of all domestic noise complaints were estimated to be associated with night-time indoor music or animal noise;

[1] CIEH recommended definition of resolution: a) no further local authority action is possible and appropriate advice has been given; or b) formal action has been taken; or c) the policy and procedure adopted by the local authority for dealing with noise complaints has been followed through to completion, i.e. i) informal action by negotiation or warning letter; or ii) reference has been made to another service outside the local authority's control.

- 55% of complaints were attributed to unreasonable behaviour - other reasons included poor sound insulation, complainants' sensitivity and high expectations;
- a wide variation in the services provided by local authorities for responding to domestic noise complaints, both within and across groups of Councils, was evident;
- target response times, policies and procedures for responding to domestic noise complaints were widely established and used by 91% of respondents;
- specific procedures and target resolution times for resolving domestic complaints were less well established and used by 41% of local authorities;
- nuisance was, on average, confirmed in 20% of all complaints investigated;
- **formal remedies for dealing with domestic noise complaints were used to resolve approximately 5% of all domestic noise complaints investigated:**
- 6% of all respondents indicated that the new night noise offence was likely to be adopted by their council, whilst 13% of authorities indicated that no decision had yet been made;
- 81% of the local authorities gave a positive indication that they were unlikely to adopt the proposed powers contained under sections 1-9 of the *Noise Act 1996* when they became available.

Acknowledgements

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The contribution of all local authorities who provided time and resources to complete the main questionnaire is gratefully acknowledged. The input to the development of the questionnaire provided by officers of the CIEH, NPL, NSCA, DETR and the ten local authorities who participated in the initial pilot survey and who contributed to the development of the questionnaire is also gratefully acknowledged.

Table 1: Number of Questionnaires returned by Local Authorities

Type of Council	Total No.	Blank Returns	Respondents	Percentage Response
District	274	6	157	57 %
Metropolitan District	36	1	17	47 %
Unitary	35	2	17	49 %
London Borough	33	0	17	52 %
Totals	*378*	*9*	*208*	55 %

Table 2: Complaints received according to Category of Noise Source (n = 186)

Source	Number of Complaints	Mean Complaints per Authority	Complaints per Million Population	Percentage of Total Complaints
Industrial/Commercial	22,291	120	885	21 %
Domestic	69,300	373	2,751	66 %
Construction	5,168	28	205	5 %
Vehicles in the Street	2,967	16	118	3 %
Equipment in the Street	1,981	11	79	2 %
Transport*	1,282	7	51	1 %
Other	1,900	10	75	2 %
Total	*104,889*	*564*	*4163*	

* 5818 aircraft noise complaints reported by one authority not included in this analysis.

Figure 1: Mean Number of Domestic Noise Complaints received by Type of Authority

[LBC: London Borough Council (n = 16); MDC: Metropolitan District Council (n = 17); UC: Unitary Council (n = 15); DC: District Council (n = 148)]

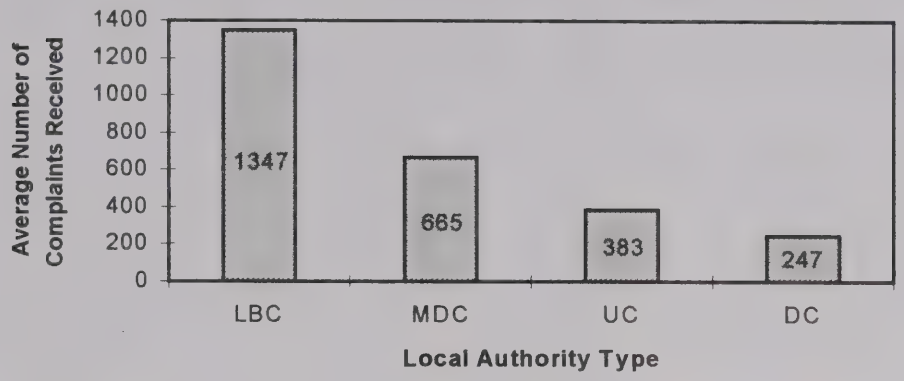


Figure 2: Percentage of Local Authorities with Target Response Time (n = 207)

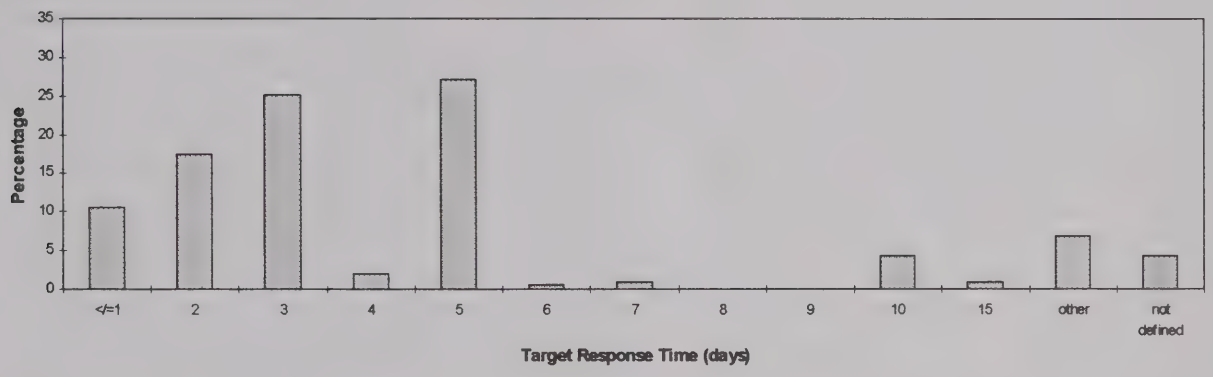


Figure 3: Services Provided by Local Authorities for Responding to Domestic Noise Complaints

Other hours include all on-call/stand-by/emergency services provided outside normal office hours for responding to domestic noise complaints

[LBC (n = 17); MDC (n = 17); UC (n = 17); DC (n = 154)]

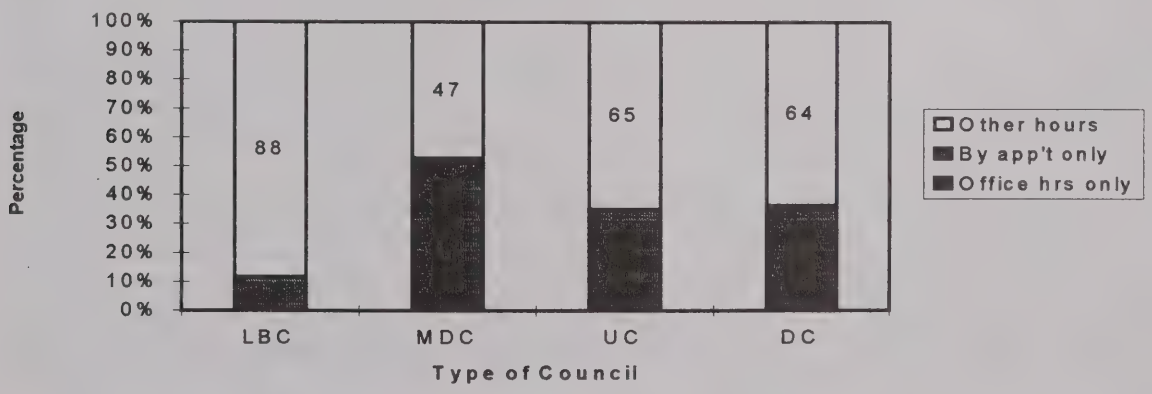
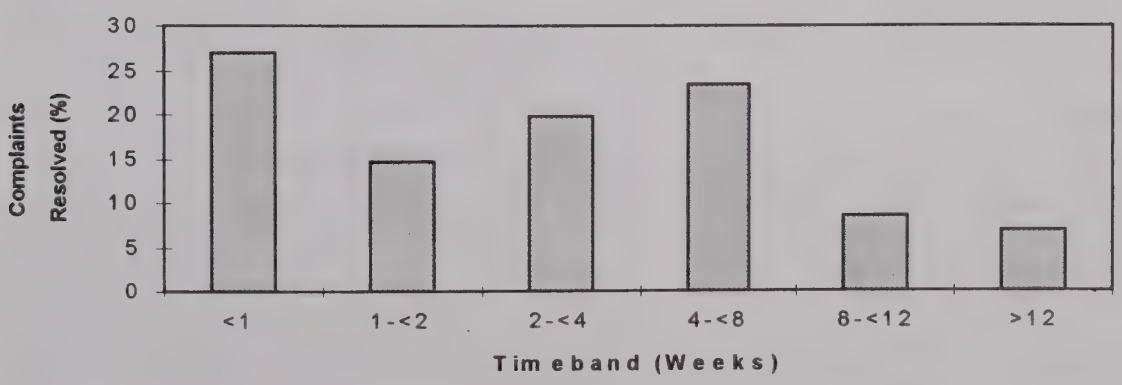


Figure 4: Percentage of Complaints Resolved within Weekly Timebands (n = 112)



Reducing Neighbour Noise Complaints Proactive or Reactive Approach?

Robert Heathcock
Winchester City Council, Senior Environmental Health Manager

Increasingly, Environmental Health Departments are facing an ever worsening problem of rising numbers of noise complaints within their areas. There are a wide variety of factors and reasons that may be leading to this increase within particular areas but local authorities have an additional challenge of having to deal with these increasing numbers with ever dwindling resources. This paper describes some of the proactive approaches to this problem that have been tried at Winchester City Council in order to try and stem the tide and as a means of providing long term solutions to the problems encountered within our area.

Few Caveats

The methods described in this paper have all been implemented at Winchester City Council and seem to have led to a recent decrease in the numbers of complaints received by the Department. Whilst it is difficult to objectively demonstrate a clear link between the two factors, from first impressions it would appear that the proactive approach being adopted by the Environmental Health Department is helping to reduce the number of complaints received. The purpose of this paper is to describe what has been done, but individual authorities are far more aware of the nature of their own area, the types of complaints that are received and the resources that are available and this will influence the way their noise complaints are dealt with. In simple terms, the measures described in this paper can be used as a 'pick and mix' option where individual parts may be appropriate to specific authorities.

How is it For You?

With the increasing numbers of noise complaints, many local authorities are finding themselves in a position where they are becoming swamped by the workload at a time when resources are often finite and not necessarily being increased to deal with the problem. This can be a particularly frustrating situation for staff who are not able to adopt an approach of working proactively when they are fighting to catch their breath to deal with the complaints at hand. This is an important factor for the future and in many respects will require a major paradigm shift of thinking amongst authorities and elected members to get commitment from the top to adopt a proactive approach if this is considered the way forward.

Description of Winchester City Council's Area

Winchester City Council's Area covers approximately 250 sq. miles and has a population of approximately 101,000. The main urban part of the district is contained within the Winchester City Centre area, although there are a couple of outlying villages and towns with populations of about 10,000.

The Environmental Health Department has 32 staff, located within two divisions; the Operational Division and the Policy Division. Noise issues are dealt with by the Environmental Protection Team (within the Operational Division), with 7 staff dealing with a wide range of other pollution related disciplines, including water supplies, dog control, statutory nuisance, Environmental Protection Act authorisations, planning consultations etc. The Environmental Health Department was awarded the Government's Citizens Charter Charter Mark in 1996 in recognition of the quality of its services and in particular the customer focus on the way services these are delivered.

Monitoring shows that during the past five years the Environmental Health Department has received the following numbers of noise complaints:

Year	1992/93	1993/94	1994/95	1995/96	1996/97
No. of Complaints	289	312	512	540	345

The trend in numbers of complaints over the first 4 years roughly followed the national trend with the number of complaints increasing from approximately 300 in 1992/3 and 1993/94 to just over 500 complaints in 1994/95 and 1995/96. Against this background of an increasing number of complaints, the Department had already begun to consider the merits of a proactive approach in dealing with complaints. As part of its customer orientated culture, the Department has increasingly adopted measures and means aimed at resolving complaints before they become the subject of enforcement proceedings. This work has been continuing for some time and last year in 1996/97, the numbers of complaints received showed a dramatic 37% decrease. The question is "Does this demonstrate the effectiveness of the approach?" It is almost certainly too early to say until the results over the next few years are known.

Searching For the Utopian Dream?

For many Environmental Health Departments, the prospect of reducing the numbers of noise complaints appears an unrealistic expectation. Nationally, the figures demonstrate that numbers of complaints are on the increase and many I am sure consider that their only option is to compete for increasing resources to deal with the complaints received.

However, is this true? There are a number of issues around the way noise complaints are dealt with and different methodologies can be adopted to deal with the problem.

Firstly, there is traditional enforcement which relies on the application of legislation to deal with complaints to resolve any nuisance that exists. However, this is only a *reactive* service and tends to rely on the receipt of a complaint before any action is taken. The work carried out relies purely on investigation, which is aimed at establishing the facts in order to decide whether a statutory nuisance exists and if formal action needs to be taken under the Environmental Protection Act. In many ways therefore, this approach is aimed at ensuring legal compliance with the local authorities' obligation to investigate complaints under the Act.

An alternative is the proactive approach which appears to be less frequently used. It relies on local authorities trying to avoid complaints occurring in the first place by taking steps often over and above the minimum investigative work required under enforcement. Within this culture, staff are able to adopt an advisory or more helpful attitude in trying to resolve complaints and in many respects the whole approach is solution orientated so that complaints are resolved without the need to use enforcement proceedings or even before any nuisance occurs.

It would appear from national surveys of numbers of noise complaints that traditional enforcement does not appear to be stemming the flow of ever increasing numbers of complaints. The question therefore has to be asked, "Is it time for a different thought process on how to reduce the number of complaints?"

Developing a Solution Orientated Culture

Despite this uncertainty, our view is that if authorities are committed to developing solutions to the number of noise complaints received it can make a difference. However, for this to take place it is vital that the culture within the organisation is in line with this desire. Developing solutions will not occur unless staff are working within an environment where they WANT to solve the problem. Where resources are limited or staff are within a culture which is geared around legal compliance or enforcement of investigations, resolving complaints in the long-term is unlikely to be achieved. This will lead to increasing numbers of repeat complaints and the authority will have to deal with the issue again and again. They may even leave themselves open to criticism and ombudsman investigations where complaints have become long-term and repetitive.

In order to get the culture right, the roles of the team manager and senior departmental managers are vital. Staff will not be able to operate within a supportive culture and be encouraged to want to resolve problems unless management creates an environment where results are recognised and staff supported in their efforts in dealing with noise complaints. If the culture relies purely on dealing with the issue as quickly as possible in order to deal with the next complaint within a "numbers game" mentality, it is unlikely that long-term solutions will be achieved. Achieving these sorts of solutions will often require a great deal of persistence as the issues are not always as straightforward as they first appear and a number of attempts may be required before the complaint is resolved completely.

The Importance of Customer Focus

If any noise investigation service is to fulfil the expectations of the complainant and deal with the issues properly, it is important that the authority is aware of the public's opinion of its service and the way in which it can be tailored and improved to meet their needs. At Winchester City Council, customer satisfaction levels for all services including the noise control service are routinely monitored; levels of satisfaction achieved are exceptionally high and consistent (90+%). It is vital, however, that staff are able to be flexible in the way that they deal with complaints, if they are to align themselves with the needs of the customer.

A proper customer focus culture will also rely on increasing amounts of publicity to help the public understand their rights and responsibilities and the measures which they can take to prevent problems occurring in the first place. Ultimately, it is also necessary for proper feedback from customers on whether the service is being effective, in order that managers can decide on the actions required to correct any deficiencies.

Proactive Approaches Taken by Winchester City Council

Winchester City Council has created an environment where staff are allowed a great deal of flexibility in dealing with, not only noise complaints, but other areas of work where satisfactory outcomes are the goal. Whilst it is important that staff fulfil any overriding legal obligations, they are allowed to explore new options for dealing with complaints where these come to light. The following examples are approaches which have been successfully adopted for certain complaints.

Barking Dogs

Winchester Dog Control staff now deal with these complaints from the start. Previously, Environmental Health Officers or noise technicians would investigate them whilst the Dog Control staff tended to deal with stray dog and fouling problems etc. However, it became increasingly clear that barking dog complaints were not like other nuisance issues and were often due to a dog management problem which was closely linked to

responsible dog ownership. It was therefore increasingly important that a holistic approach was taken to barking dog complaints.

Traditionally the approach had been to investigate the problem, establish whether a nuisance existed and then to serve notice on the complainant requiring them to abate the nuisance. However, this in itself presented problems in that we were not clearly specifying the measures needed to resolve the nuisance. This led to the possibility of appeals on the grounds that the authority had not been specific enough in its requirements to deal with the problem.

With a holistic approach, dog control staff are able to discuss the problem with the dog owner, consider the causes of the problem and advise on a solution. Because flexibility was allowed, staff were imaginative enough to establish links with animal psychology staff at a local university to get advice on the practical measures that can be taken to deal with particularly difficult dogs. For more simple problems, the dog control staff could provide advice first-hand but in some cases, the behaviour of the dog was out of control and needed a more wide-scale approach including veterinary advice.

The advantages of this approach are that the owner of the dog not only receives detailed practical advice on how to resolve the nuisance, but is also left with a feeling that we have helped them deal with what is often an additional problem they could do without. In many noise complaints, one side or the other (the complainant or the person causing the problem) is often left with a feeling that they have been victimised. With an advisory role, which arrives at a solution, the potential for a win:win situation where both "sides" are left contented is increased.

This holistic culture for dealing with dog complaints has been extended to include dog control staff providing free dog training classes to the owners of dogs within our area (not just the problem ones), organising dog shows and also issuing free engraved dog discs to help deal with the stray dog problem. Feedback received from the dog owning public is very positive and suggests that the proactive approach is proving particularly effective.

DIY Noise

This is a particularly difficult area to deal with as perceptions of what constitutes a nuisance vary considerably. Winchester has concentrated on using awareness days to increase knowledge of this type of problem and how it can be resolved. The subject has also been dealt with as part of an annual programme of visiting public shows where significant public coverage can be achieved in a relatively short amount of time. Displays at the shows are often more informative than information leaflets and help to get the message across to the public on how the problem can be dealt with.

DIY noise has also proved a particularly popular topic on a number of local radio "phone-ins" (5 in the last year). Members of the public are able to speak to a staff member on air to discuss their particular problem. This had the advantage of helping to deal not only with that particular problem but also helps to spread the message to a wider number of people.

Public Entertainment Licences

Winchester recognised sometime ago the need to achieve a consistent approach to Public Entertainment Licences (PELs) particularly if noise problems were to be avoided. To achieve this a joint approach has been adopted with the City Council's Legal Department who issue the licences and deal with the administration of the licensing system.

The Environmental Health Department's advice on PELs has been linked to the existing business advisory service; this is available to all local businesses who can contact the department for free advice on particular environmental health issues which affect their business. Specific guidelines for PEL applicants have been developed which inform businesses of measures that can be taken to prevent problems and suggesting that applicants contact the department to discuss specific problems.

A particularly successful benefit of this approach has been joint patrols with the licensing officer to a number of premises to check that licence conditions are being complied with even where complaints have not been received. This helps to deal with problems at an early stage before they are the subject of complaint which often results in the complainant's expectations being considerably higher.

Finally, the Department is working closely with Licensing Officers to update the licence conditions to include more specific noise guidelines. It is proposed to link this to the business advisory service to help ensure applicants are fully aware of the legal obligations and what can be done.

Planning Applications

Our view is that a vital means of preventing many noise complaints is to avoid the problem in the first place. This is a key factor in our proactive approach to dealing with noise issues. The Department has developed very close links with the Planning Department over a number of years; their staff now trust the judgement of the Environmental Health Department in identifying which applications require detailed environmental health input and which do not.

Whilst this has significantly increased the number of consultations examined, this approach has proved particularly effective in avoiding problems. In some cases, applications can be considered fairly quickly and no comments are required but in more detailed cases,

considerable work including noise readings, meetings with applicants and committee attendance is required to ensure that problems are avoided.

In the last five years, the Department has examined 1029 planning applications and commented on the vast majority of these with noise-controlling conditions being included in many consents; this has two benefits. Firstly, the applicant is clear about what measures are required from the outset in order to avoid noise problems and secondly, if enforcement proceedings are required at a later stage, the planning conditions can be used as supporting evidence for any statutory nuisance action. If applications have been submitted relatively recently and no conditions are included to control noise, authorities may find themselves in a difficult position to deal with the issue as a noise nuisance at a later stage, as the recipient of the notice will provide evidence in their defence that no comment was made at an earlier stage.

Another proactive measure is the Department's "Advice for planning Applicants" guidelines which mirror the advisory note for PEL applicants. Details of the information required for the planning application to be properly considered is included within the guidelines and helps to reduce the amount of time spent in going back to applicants to request more information and details. These guidelines are sent out with every planning application within the district.

Finally, a key factor in dealing properly with noise issues within the planning process is the fact that all three staff who are primarily involved have the Institute of Acoustics Diploma in Noise Control. This is unusual for a small Department of Winchester's size but was considered to be an essential requirement for ensuring that the officers dealing with the planning process were able to converse with noise consultants and check submitted noise details properly. Our view is that this investment in training has led to a better breadth of knowledge resulting in improved respect amongst local noise consultants so that more comprehensive information is submitted at the time of application.

Publicity and Marketing

As part of its customer orientated culture, Winchester's Environmental Health Department is committed to providing wide-scale publicity and information on how to deal with noise issues. As well as the plethora of information leaflets produced by the Department, on subjects such as car alarms, barking dogs, noisy stereos etc, the Department also attends a number of public shows each year, where displays are provided on a variety of issues including noise complaints. These are very well attended and from the feedback received are very positively viewed by the public.

The Department also issues regular Press releases on noise related topics as well as other areas, in order to keep the subject in the forefront of the public's mind; this has resulted in considerable coverage on a variety of topics. The Department also provides regular articles for the City Council's own publication 'Insight' which is delivered to all households within the district twice a year. This provides extra opportunities to achieve public coverage promoting measures that can be taken to avoid noise and other nuisances before they occur. Similar articles are also provided for the Housing Department's internal publication, 'Houseproud', and the Department works closely with housing staff in dealing with noise problems within council owned property.

The Department has recently become involved with a local radio station, and a senior member of staff attends regular 1 hour phone-ins during the afternoon. Five such phone-ins have taken place during the last 6 months with a large number of calls being received and answered on air. These dealt with not only noise complaints but other issues including nuisances etc. The phone-ins seem well received by the public and have resulted in requests for information to the Department afterwards. They also allow the department the opportunity to promote current areas and topics which are relevant to that month.

Finally, the Department also attends tenants representations and residents associations meetings to discuss particular problems that affect certain areas. This has included presentations to tenants who have a problem with vehicles and dogs in a problem area and to Residents Associations who are concerned about noise from a nearby trunk road. This approach helps to improve contact with the public and shows that officers are prepared to meet concerned complainants at particular times and have a more human face that may otherwise be perceived. It also allows the opportunity to describe the limitations that can occur sometimes with dealing with noise issues.

Student Noise

Winchester has a large student population from a number of colleges within the city. As part of a proactive approach to this area, staff began liaison meetings with a number of colleges within the city several years ago. This led to the Department producing information for each year's student intake to advise them of a potential for problems and the measures that can be taken to avoid them. For the relatively short amount of time that was required to set this up it provided an opportunity to get information to all students and supported the colleges' commitment to help deal with the problem when it occurred. The information was also evidence to residents that action was being taken to try and deal with the problem.

However, a key aspect in dealing with the student noise problem was the Department's involvement at the planning

stage when new accommodation was being developed; advice was given to planners and developers on the layout of the building and measures suggested to try and design-out the problem. Advice on new Student Union accommodation, halls of residence and venues for Public Entertainment Licences has also been given.

Another opportunity for dealing with the student noise problem is mediation; often the situation can deteriorate to the point where residents view students as an intrusion within their area and students consider that residents are being unreasonable in their perception of what needs to be achieved. Here the department has acted as a mediator and facilitated meetings to agree a way forward. Once dialogue has been established between both sides, the Department does not always need to be directly involved in future discussions.

Experiments

Whilst the above approaches have proved effective, the Department constantly tries new ways of dealing with particular problems through a process of continuous improvement.

One such approach has been the use of a split summer shift between May to September, to deal with noise complaints that occur out of hours, particular during these months. The Department is currently reviewing its out of hours noise provision but, in the meantime, staff volunteered (under their own initiative) to operate a split shift system with one member of staff starting work at 4pm and working through until 12pm for four nights to deal with noise complaints.

The main advantage is that the public can be advised that an officer is available to deal with their problem that evening if necessary and staff do not have to attend a problem from home, which was perceived as being particularly intrusive. Complaints are screened via a central telephone number and the officer contacted at the office if it is necessary to attend. Whilst on site, they have a mobile phone and can be redirected to another problem afterwards without the need to return to the office.

This has proved particularly effective in dealing with what were previously long-standing complaints. Staff found it difficult to gather evidence to establish whether a nuisance existed or not because of the sporadic nature of the problem and the fact that officers were not always available. It has also helped to pick up other problems that were not the subject of complaints when officers were out on 'patrol'.

Another development for next year is for dog control staff to study animal psychology. Successful contacts have been established with the local university, as described earlier, but it is felt that once qualified, dog control staff are better placed to offer more immediate advice. The most important aspect of this development is that this did not come form management but from the staff themselves. Whilst it will involve investment from the Department in paying for tuition fees etc, it has the benefit of a 'one stop shop' type of advice for dog owners which will avoid the necessity to involve university staff.

Out of Hours Provision

No doubt, like Winchester, many authorities are considering their provision of out of hours cover for noise complaints in the light of the recent Chartered Institute of Environmental Health Guidelines. This review is being carried out within an environment where public expectation for 24 hour cover for such complaints is increasing; this presents a particular problem for small departments such as Winchester. The numbers of staff concerned mean that provision of a proper 24 hour cover with staff who are adequately trained in noise control issues, will be difficult, with staff having to be on-call approximately once per month which is particular intrusive and difficult for their own circumstances. Whilst it would be possible to extend such a service to all other Environmental Health staff, it is our view that it is increasingly important that such staff are properly experienced and qualified in dealing with noise control issues in order to resolve problems properly. The present split summer shift system described earlier is viewed only as a temporary solution. At present, the Department is undergoing a comprehensive noise review with the Hampshire Police linked to their "Enforcing the Peace" campaign to establish the needs of both agencies to ensure that any service is designed in a way that will properly address the problem. It is clear that the partnership between both sides can help to address the issue, with the Police providing more detailed information and support where necessary and the Department providing the resources and ability to respond to noise complaints when they occur.

This review is still underway and the options being considered for the future are not yet established but it is likely that the Department will opt for employing a suitably qualified out of hours technician for dealing with, not only noise complaints, but also other issues. Such a technician will probably start work at approximately 5pm and work through until 1am or 2am. It is considered that this provides a better solution than contracting out the service as this presents difficulties for achieving effective contact with out of hours staff to ensure they are up to date on developments.

The Future

Whilst all of the above measures have helped to make a difference at Winchester in the way noise complaints are dealt with, it is our view that there are a number of emerging issues for the future which could make a significant contribution to dealing with noise complaints, not only in our area but indeed across the country.

Environmental Protection 1997 Conference Report

Environmental protection specialists from industry, local authorities and consultancies gathered in Glasgow this October for the annual NSCA Environmental Protection Conference and Exhibition. Delegates heard presentations from the country's top environmental experts, toured a wide-ranging exhibition, and enjoyed social events including a Scottish evening and a trip round a whisky distillery!

THE HEADLINES:

- **Treat the earth as if we intended to stay**
  - Sir Crispin Tickell
- **Agenda 21 "must come out of the portacabin"**
  - LGA's Phil Swann
- **Road freight should be considered essential services**
  - RHA's Steven Norris
- **Call for urgent Government action to tackle air pollution**
  - NSCA's Richard Mills
- **Politicians must not "chicken out" of unpopular measures**
  - RCEP's Sir John Houghton
- **Make sustainable development plans a statutory duty**
  - Derek Osborn
- **Radon grants would be "health bargain of the decade"**
  - Alan Blythe
- **New health concerns about carbon monoxide**
  - Prof Peter Burney
- **National sustainability indicators on the way**
  - Graham Pinfield

....more details inside

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THE CONFERENCE...

Opening this year's conference, NSCA President **Sir Crispin Tickell** gave his personal definition of sustainable development - *"Treating the earth as if we intended to stay"*. He then outlined the four major global environmental problems facing society as he saw them: population growth; land and water degradation; deterioration of biodiversity; and changes to atmospheric chemistry.

Sir Crispin Tickell

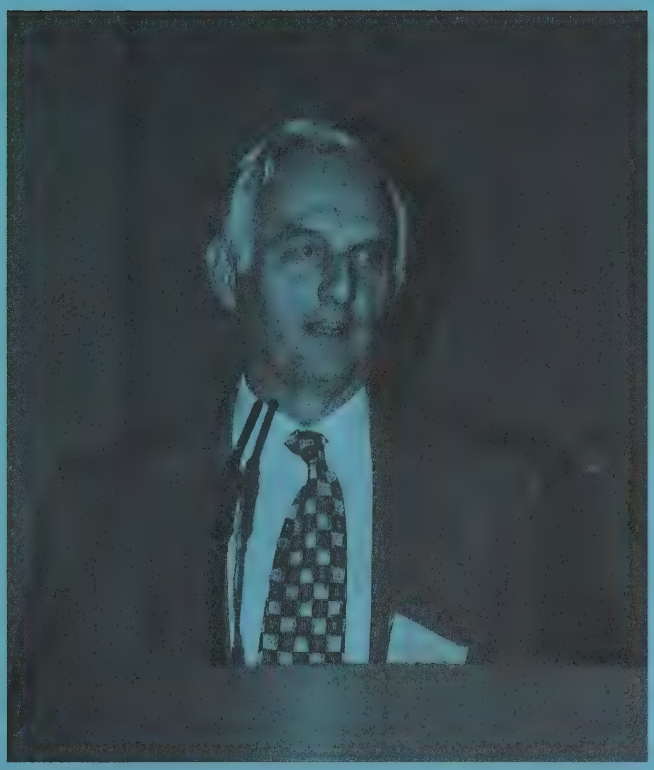
Sir Crispin said that these global problems require international agreements and cooperation. But that *"...such agreements can only be implemented by effective national, regional and local action. As the Rio Summit recognises, in the first and last resort sustainable development belongs to local communities, and families and individuals within them, to make it work....Strong communities produce strong results."*

Finally he concluded: *"This Society [NSCA] has a more than honourable record, over almost a century, for bringing together and expressing opinion on the central environmental issues. Pressure from below is almost as important as leadership from above, but we badly need both. We do not want future policy to be made by and through catastrophe. Here is the real challenge."*

NSCA Vice President and Director of the Road Haulage Association **Steven Norris** said that road freight and public transport should be treated separately from private car use. Freight should be considered essential services and allowed to use bus lanes off-peak. Mr Norris said that bus deregulation was "not as black as it is painted" but accepted the need for quality standards for bus operators. New buses are operating in competition with 15-year old, poor quality, polluting buses, he added. Mr Norris called for: increasingly tighter technical standards for vehicles; further fiscal incentives to favour cleaner vehicles and fuels; and tighter regulation on cowboy HGV operators. RHA members would welcome a higher operators' licence fee, if this was used to improve Vehicle Inspectorate enforcement activities, he said.

Steven Norris

Sir John Houghton, Chairman of the Royal Commission on Environmental Pollution claimed yesterday that European vehicle emission standards are still not tough enough. The technology to reduce emissions - particularly CO_2 - is already in place, but fiscal incentives are not strong enough, he said. "Very radical action" will be needed to hit the UK CO_2 targets (20% reduction). There is no reason why we can't have cars which are 40-50% more energy efficient, according to Sir John. Politicians must not "chicken out" of unpopular measures - carrot and stick measures will be more effective used together than separately.



Sir John Houghton

A call for the introduction of a "Mandatory Radon Mitigation Grant" was made by **Alan Blythe**, a leading expert on radon issues. An estimated 66,000 households are at risk from radioactive radon gas. *"The new Labour administration must grasp this nettle firmly or the current totally unacceptable burden of 2,500 radon induced deaths each year will continue", he said. "This could be a very cheap and popular way to achieve the health bargain of the decade."*

A new set of seven key UK sustainable development indicators will be released for consultation by the Government this autumn, according to **Graham Pinfield** of Lancaster City Council. They will be used to inform action by central and local government, business and individuals, and will cover climate change, indoor and outdoor air quality, water, biodiversity, beauty and tranquillity, natural resources, and health. Graham also introduced a new acronym - MEGO Indicators. That stands for "My eyes glaze over"...

NSCA Secretary General **Richard Mills** called for urgent Government action to tackle air pollution. The Society's has written to the Minister for the Environment, **Michael Meacher**, urging the Government to table the necessary regulations to implement the UK National Air Quality Strategy without further delay.

Calling for a package of further measures to close the "policy gap" in the current Strategy, he said... *"The Government's commitment to implementing the current Strategy is welcome. But this commitment must be backed up by the regulations and powers necessary to allow local authorities to actually get on with the job of improving local air quality."*

NSCA Vice President **Derek Osborn** called for local authorities to be given a statutory duty to prepare local sustainable development plans, which would go beyond traditional land-use plans to include activities, services and health issues. This was a major recommendation of the recent report by the CIEH Commission on Environment and Health. NSCA is well placed to develop this work on local environmental management, he said.

Carbon monoxide appears to be linked to health effects at much lower levels than had previously been thought, according to **Prof Peter Burney**. Updating the conference on air quality and health issues, he said that new evidence suggests that CO could have an impact at levels below the current national air quality standard.

Local Agenda 21 has to have the corporate significance it deserves, according to **Phil Swann** of the Local Government Association. Wider issues than just planning and transportation need to be brought into the equation - things like public health, social exclusion, regeneration and economic development.

Richard Mills

EXHIBITION SELLS OUT

The NSCA's Conference Exhibition sold out this year, with over twenty exhibitors, taking stands.

The Society welcomed the valuable support of:

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Transport Research Institute (Napier University)

Unike Multifuel Ltd

Wimtec Environmental Ltd

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OUT AND ABOUT

Outside the conference, delegates enjoyed **technical visits** to a BP oil refinery and Hunterston nuclear power station. On the lighter side, **social trips** to Loch Lomond, the Trossachs and a distillery were greatly appreciated.

The exhibitors hosted a welcoming reception on Monday night, whilst many delegates hired kilts for a wild **Scottish dance evening**, complete with Ceilidh band. The **Conference dinner** was much appreciated, and the local bars and clubs showed traditional Glaswegian hospitality to many delegates into the small hours.

SEE YOU BY THE SEA

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The Building Regulations

One such area is the issue of the Building Regulations and testing of properties for proper sound insulation before occupation. Such a system has been in place in Scotland for some time and it is considered that a similar system for the rest of the United Kingdom is long overdue. Whilst plans and details may be submitted to demonstrate that structures will achieve the noise insulation requirements of the Building Regulations, it is not always possible to establish that buildings have been built in accordance with the plans submitted once they are constructed unless regular site inspections have been carried out. Minor discrepancies in construction such as wall/floors touching etc., have a significant impact upon the acoustic quality of any partitions etc. Our view is that the only way to demonstrate proper compliance is for testing to be undertaken to check the performance. Where problems are revealed then these would have to be rectified before the building could be occupied.

Such an approach may lead to difficulties initially where properties fail the test but in the long-term the building industry will become clear that the construction quality is vital to ensuring that the standards are achieved.

The role of Customer Focus Groups

Another area is the role of customer focus groups in establishing the way that noise complaints are dealt with. These days, it is not sufficient for staff to develop their own solutions and approaches for dealing with noise complaints, without properly considering the views of the service requesters; customer focus groups offer one of the best ways of achieving this. At present, Winchester relies on customer satisfaction monitoring but is to explore ways in which customer focus groups can be used to address this area more comprehensively. We feel this will provide an opportunity to get more detailed information and opinions than would otherwise be achieved through routine customer satisfaction monitoring.

The need for a Proactive approach

In the long-term, Winchester staff feel that it is vital that local authorities become more proactive in dealing with noise complaints. However, this cannot be achieved until the right organisational culture is created that encourages this type of approach. Management's role in this culture will be vital. Authorities in many respects are at a cross roads in the noise complaint issue. They are faced with a dilemma of increasing public expectation about their quality of life and also diminishing resources in dealing with the overall problem. However, it is important that new ways of thinking are considered and proactive approaches are properly viewed as an important way of reducing the overall problem. This is the challenge for the authority and hopefully the experience at Winchester may provide the incentive for others to consider a similar approach.

Ultimately, authorities can carry on as they have done previously. However, consider the following old adage before adopting this approach: 'The definition of insanity is to carry on doing the same thing, expecting different results'.

Future UK Noise Policy

Dr Malcolm Eames
NSCA Policy Officer

This paper briefly reviews developments in UK noise policy, which has in recent years tended to be dominated by the problems of neighbour and social/recreational noise. The principal findings of the NSCA's 1997 Noise Survey are outlined and an activity report on National Noise Awareness Day given. A number of current policy developments at both a European and national level are then considered and their implications discussed. In particular, it is suggested that environmental (transport and industrial) noise problems are likely to receive greater attention in the years ahead, and that this will necessitate developments in noise mapping and the reduction of transport noise. Within this context, a number of provisional priorities for future UK action are proposed.

Neighbour/Recreational Noise Policy

In recent years the noise policy agenda in the UK has tended to be dominated by the problems of neighbour and social/recreational noise. This has resulted in a raft of legislative, regulatory and managerial developments intended to provide local authorities (LAs) with a clearer mandate, powers and procedures to tackle these problems. These have included:

- *Neighbour Noise Working Party "Review of the Effectiveness of Neighbour Noise Controls", DOE (1995)*: Established by the Government in 1994, the Neighbour Noise Working Party made a series of nine influential recommendations relating to the management of LA noise services, liaison with the police, confiscation of noise making equipment and the creation of a separate night time noise offence.

- *The Noise Act 1996*: Clarified LAs powers of confiscation and created the new night time noise offence which came into effect on National Noise Awareness Day - 23 July 1997. Adoption of the new offence by LAs is discretionary. The Government is committed to a review of the take up and effectiveness of the Act in two years time.
- *CIEH Management Guidance (1997)*: Earlier this year the CIEH published guidance aimed at encouraging LAs to review their noise policies and practices, promoting best practice and greater consistency of service between authorities.
- *CIEH/ACPO Noise Liaison Guide (1997)*: Also earlier this year, the CIEH together with the Association of Chief Police Officers (ACPO) published good practice guidance setting out the respective roles and the minimum standards of cooperation between the police and LAs.
- *Codes of Practice:* A number of voluntary codes of practice have been published, or are currently under development, to tackle specific recreational noise problems. These include codes covering, for example: clay target shooting (CIEH); pubs and clubs (Institute of Acoustics); water skiing (British Water Ski federation); and, organised off-road motor cycle sport (Noise Council). The NSCA's own "Code of Practice for the Control of Noise from Oval Circuit Motor Racing" is presently being considered for approval by the Secretary of State under s.71 of the *Control of Pollution Act 1974*.

NSCA Noise Survey & Noise Awareness Day 1997

The NSCA Noise Survey 1997 and LA support for this year's Noise Awareness Day (NAD) provide some preliminary indication of the impact of these policy developments.

The NSCA surveyed all UK LAs to coincide with NAD. The results of this research indicated that complaints about amplified music, dogs, and pubs and clubs have all increased significantly over the last year. It also found that only 8% of LAs are likely to adopt the new night time noise provisions. Forty-eight per cent of authorities gave lack of staff/resources as their reason for not taking them up, whilst 43% of authorities considered existing cover for noise complaints adequate. On a more positive note, 86% of LAs do now have their own mechanisms in place for dealing with night time noise complaints, according to local demands and resources. (Full details of the survey are available in *Clean Air*, No. 5, Vol. 27, 1997.)

Local authority support for NAD - which was coordinated by the NSCA and took place on 23 July - was also encouraging. At least 180 LAs participated in a variety of awareness raising activities on NAD 1997, compared with approximately 48 which participated last year. Activities ranged from issuing press releases and "loudest shout" competitions for children to guess the decibel level of the Town Hall chimes and initiatives on car and burglar alarms. These were successful in generating widespread local media interest in council noise services, which was complemented by significant national media coverage of noise issues more generally.

Overall then, although noise complaints are continuing to increase, there is evidence to suggest that the majority of LAs are now taking noise issues more seriously and are taking action to improve the level of service they provide to the public. However, many LAs clearly feel that the new powers available under the *Noise Act 1996* require a disproportionate input of resources.

Current Policy Developments

There are a number of current policy developments, at both a European and national level, which suggest that issues relating to environmental (transport and industrial) noise are likely to receive considerably more attention in the years ahead.

- *European Commission's Green Paper "Future Noise Policy", COM(96) 5430 final, 1996*: The central message of the Green Paper is that environmental noise pollution is to be given greater prominence on the European Union agenda. In general this is a development which should be welcomed. Although national and cultural factors are important in the assessment and regulation of noise pollution, there is clearly an appropriate role for the EU in harmonising aspects of noise policy: establishing common product standards, promoting research and the exchange of information. The development of common metrics and techniques for noise mapping are central to the strategy outlined within the Green Paper. (For details of NSCA's response to the Green Paper, see *Clean Air*, Vol 27, No. 4, 1997.)
- *UK Implementation of EC Directive 96/61 on Integrated Pollution Prevention and Control (IPPC), DETR, July 1997*: The DETR is currently consulting on the implementation of this Directive, which will for the first time require the prevention and control of noise and vibration to be considered within the UK industrial pollution control regime. At present it is unclear how responsibility for these functions will be divided between LAs and the Environment Agencies. The DETR consultation raises the possibility of developing some form of Coordinated Pollution Control, rather than using the current Integrated Pollution Control (IPC) regime, as the mechanism for implementing the Directive for certain installations. Whichever agency is responsible, however, it would appear likely that noise mapping techniques will again have an important role to

play. (For NSCA's response to the consultation document, see *Clean Air*, Vol. 27, No. 6, 1997.)

- *"Developing an integrated transport policy", DETR, August 1997*: Although this consultation paper makes scarce mention of noise issues, it does make clear that "*the Government is committed to facilitating the mobility of the British people in an economically and environmentally sustainable framework*". This consultation and the forthcoming transport White Paper therefore provide an important opportunity to raise the profile of noise issues - for road, rail and air transport. (With respect to the use of low noise road surfaces and noise barriers in particular, the United Kingdom has a poor record in comparison to many other EU States.) After all, any genuine attempt to move toward a less environmentally damaging, more sustainable, transport system will inevitably have to confront the problem of noise pollution.

Future Priorities

Given the above, it would appear that we are approaching an important juncture in UK noise policy. As recent initiatives on neighbour and social/recreational noise begin to take effect, it is likely that environmental (transport & industrial) noise issues will increasingly come to dominate the policy debate. It is therefore helpful to suggest a number of possible short-to- medium term priorities for all of those involved in the development of noise policy in the UK.

- Research and development into appropriate and affordable techniques for noise mapping.
- Research into the possible synergies between the noise mapping and the techniques of local air quality review and assessment.
- Recognition of the possible noise control/reduction gains from Local Air Quality Management within the current review of the National Air Quality Strategy.
- Action to ensure that noise concerns are addressed effectively in the Government's forthcoming transport White Paper and the subsequent development of an integrated transport policy.
- Action to ensure that LAs existing expertise on noise issues is utilised effectively in the implementation of the IPPC Directive.
- Monitor uptake of Noise Act powers and wider developments in neighbour noise control.

PRESIDENT'S ADDRESS

Global Problems and Local Policies

Sir Crispin Tickell
President, NSCA

This address was delivered at the opening session of the Society's Annual Conference, held in Glasgow 20-23 October 1997.

Introduction

In recent years the Society has had distinguished Presidents from diverse backgrounds - Lady Platt, Lord Nathan, Lord Lewis and Dame Barbara Clayton: an engineer, a lawyer, a scientist and a research professor. Now perhaps least likely, a diplomat. This variety of backgrounds reflects the diversity of the Society and the breadth of its interests, as it has moved over the last century from a smoke control society, to a clean air society, to a body with a wider concern for environmental protection generally.

I salute the work of Dame Barbara, and am glad that she will continue to play an active role in the affairs of the Society. It is no accident that during her Presidency the last Government accepted the National Air Quality Strategy. It now remains to put it into effect.

My title **Global Problems and Local Policies** falls under the wide umbrella of sustainable development, one of the cant phrases of our time. This is less one idea than a convoy of ideas. The individual members of the convoy have distinctive aspects, travel at different speeds, go under water as well as on the surface, and are not always intelligible or even visible to each other. Yet they have a common characteristic: they are moving in the same direction even if the direction itself is far from certain or fixed.

Problems of Definition

The familiar definition of sustainable development from the Brundtland Commission report of 1987 - "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" - begs more questions than it answers.

Development is so over-used a word that it has lost real meaning. It creates little more than a fuzzy impression of beneficent change. Needs are more specific but change from place to place and generation to generation. What is - or was - indispensable to some is unnecessary or even irrelevant to others. If we cannot easily define the needs of the present, how much less can we define those of the future. The same goes for the choice of what is to be sustained.

Yet sustainable development is still useful. The convoy needs a flag to travel under. We must make the best use of it that we can. As a flag or slogan it serves well. In my view the best serviceable definition of it is "durable change for the better while protecting the earth we inherit and the earth we bequeath." Or more simply: "Treating the earth as if we intended to stay."

Global Environmental Problems

What is it that we are trying to sustain? I suppose it is the good functioning of the planetary life system of which human activity is only a tiny part. Many still enjoy the bizarre illusion that the world was made for humans. Hence we fail to notice or to measure what is going on around us. There are four main global problems. Directly or indirectly they all concern the affairs of this Society.

- *Population*

There is the incredible multiplication of one animal species - our own - which now takes 40% of primary photosynthetic production on land. The figures are amazing. We would find it easier to see their significance if we were dealing with another species such as crabs or sparrows or earwigs! Our numbers rose from around 10 million at the end of the ice age 10,000 years ago to 1 billion at the time of Thomas Malthus in 1800, to 2 billion in 1930, to almost 6 billion in 1997. Now over 90 million more people are added every year, or a new China every 12 years. Since the Rio Conference five years ago, there are 450 million new people on the earth.

- *Land and Water Degradation*

There is a corresponding rise in the consumption of resources, both renewable and non-renewable, and increasing saturation of the natural sinks for our wastes. In addition there is widespread degradation of land and water: the UN Environmental Data Handbook for 1993/94 calculated that approximately 17% of the world's soils

should be considered degraded as a result of human activities. According to this month's *WorldWatch* magazine the amount of topsoil lost to erosion is 25.0 billion tons each year, compared to the 0.4 million tons created by nature. There is increasing pollution of rivers, aquifers and the oceans. Meanwhile demand for fresh water doubles every 21 years and is accelerating. Yet supply in a world of 5.8 billion people is the same as at the time of the Roman Empire in the West and the Han Empire in the East in a world of 200 to 300 million people.

- *Deterioration of Biodiversity*

There is destruction of natural biological diversity on the scale which followed the likely impact of a planetary body 65 million years ago and ended the long dominance of the dinosaurs. Worldwide some 1,000 to 10,000 species have been lost in the last year. WWF announced earlier this month that two-thirds of the world's forests have been lost forever. They are being cut down and burned at an increasing rate with an area the size of England and Wales disappearing each year.

There is no conceivable substitute for such ecosystems. Yet we cannot continue to assume that they will come for free for ever. Their value was demonstrated in the first ever attempt at quantifying the global value of natural services published in *Nature* in May 1997. Researchers from the University of Maryland estimated that the earth's ecosystem services are worth around $33 trillion a year. Compare this with the current annual GNP of all countries in the world, which is about $18 trillion.

- *Changes in Atmospheric Chemistry*

Of all environmental problems changes in the atmosphere make the most impact on ordinary people. There is the classic problem of acid rain from sulphur and nitrogen emissions from industry and power stations. This is a particular problem in Eastern Europe and in China, where high-sulphur coal is the major source of energy. Rightly or wrongly Britain often stands accused by our neighbours downwind to the North and East. When your predecessors were establishing this Society as the Coal Smoke Abatement Society in London almost exactly a century ago, Henrik Ibsen, across the North Sea in Oslo, was already referring in one of his plays to the effect on the Norwegian countryside of sulphur emissions from the industrial centres of northern England.

Ground-level ozone ("summer smog") is mainly caused by a combination of traffic pollutants, and is found at high levels in hot weather. It causes such respiratory problems as coughing, congestion and chest pain. It can also damage materials: for example rubber. Partly due to the efforts of this Society, the new National Air Quality Strategy recognises that this is now an international problem, with blobs of ground level ozone moving with the wind between countries and regions.

While there is too much ozone at ground level, there is too little in the stratosphere. Depletion of the stratospheric ozone layer at different latitudes allows more ultraviolet radiation to reach the surface of the earth. This can affect the DNA of living organisms, not least ourselves, and damage their immune systems. Last year Government advisors estimated that human-made damage to the ozone layer would cause around 8,000 extra skin cancer cases in Britain each year. The effects on ecosystems generally are not yet fully understood, but obviously could affect the food chain from top to bottom.

Greenhouse gases are increasing at a rate which could change average world temperature, with big resulting variations in climate and local weather, and sea levels. Since the beginning of industrial times, carbon dioxide is up 25%, and methane by 100%, with both - and nitrous oxide - still rising. We know from the analysis of ice cores that the content of carbon dioxide has risen from around 190 ppm during the last ice age to 280 ppm in pre-industrial times to around 360 ppm today. The rate of increase is about 5% per decade.

According to the Intergovernmental Panel on Climate Change's Second Assessment in 1995, average global mean temperature could rise by between 1.0%C and 3.5%C by the end of the next century. This represents an average rate of warming greater than any seen in the last 10,000 years. Likewise sea levels could rise by around half a metre between now and the end of the next century, a rate 3 to 6 times faster than that of the last 100 years.

The prospect of global warming is well known. Less commonly known is the phenomenon of regional cooling. Warming of the Arctic could change the present system of ocean currents so that the benevolent Gulf Stream no longer surges north-eastwards and heats Western Europe. The North Atlantic transports heat towards the British Isles equivalent to 27,000 times the power generation capacity of Britain. In a paper to the Prime Minister this month, Sir Robert May, the Government's Chief Scientific Advisor described the prospect of this ocean current being reduced significantly or turned off as "awesome".

There are many uncertainties. Change goes in steps rather than curves, and as thresholds are passed the system could behave unpredictably. Climate is the classic case of chaos theory.

Together these processes amount to an acceleration of environmental change unprecedented since humans became an identifiable animal species. In short humans are engaged in a kind of global experiment in which they are unwittingly both the experimenters and the experimented on.

How are we to cope with these problems? I examine

approaches and policies at three different levels: international, national and local, focusing on the problems that will be familiar to you all: those of the atmosphere in which we have our being. I speak at a time when the international community is waking up to the devastating consequences air pollution can cause, as seen in South-East Asia.

International Approaches

- *General*

Over the last quarter century, people the world over have become increasingly aware of environmental problems. They far surpass the power of any country, however big or powerful, to cope. Hence the slow, uneven growth of international institutions and agreements. They remain incomplete and imperfect. But from the first United Nations conference on the environment at Stockholm in 1972, through the creation of UNEP and the report of the Bruntland Commission, to the Rio conference in 1992, there has been a steady evolution with a fashioning of new international instruments.

At Rio nearly all governments agreed that global action on the environment was essential. The non-governmental organisations felt the same way. But they knew as well as anyone else that the more global a problem was, the more difficult it was to do anything about it.

The Rio Declaration set out the broad principles of environmental responsibility, including three in particular: the precautionary principle; the principle that the polluter should pay; and putting the environment at the centre of decision making. Also agreed at Rio was Agenda 21, a text for managing the environment in the 21st century. The UN Commission on Sustainable Development is designed to monitor the agreements reached at Rio, especially those contained within Agenda 21.

Let me now look at some of the specific issues.

- *Acid Rain*

Over the last two decades somewhat uneven progress has been made in combating acidification in Western Europe through the Convention on Long Range Transport of Air Pollution under the UNECE. Sulphur pollution from factories and power stations should drop to around 10% of 1980 levels over the next 15 years. We must now do what we can to make available the knowledge gained in Western Europe to other areas of the world.

- *Ground-level Ozone*

At least there has been wide recognition of the problem. A group of eight European environment ministers agreed in London in May last year to eliminate summertime smog by 2005. They called for closer cooperation within the European Union, and for tighter exhaust limits across Europe. We still await results.

- *Stratospheric Ozone Depletion*

The international measures taken to limit and eventually eliminate the use and manufacture of ozone-depleting substances is an international success story. From the first identification of the problem by the British Antarctic Survey in 1985 to the conclusion of an agreement to phase out use of the pesticide methyl bromide last month, there has been extraordinary progress. It is true that the problem was relatively narrow and manageable. It is also true that there is continuing defiance of the bans, and an illegal trade in chlorofluorocarbons. The more exceptions there are, the more possibilities for abuse. Monitoring of agreements is more than ever necessary. At the same time it would be churlish not to acknowledge a remarkable international achievement.

- *Climate Change*

Unlike the problems of ozone depletion, those of climate change touch all aspects of the modern economy. For once Britain is among the ranks of the virtuous. We shall fulfil our obligations under the Climate Convention to reduce our carbon dioxide emissions to 1990 levels by 2000; and the new government has set itself the ambitious target of reducing them to 20% below 1990 levels by the year 2010. For their part the European Union, which contains a number of notable laggers among its Mediterranean members, has proposed reducing them by 15% by 2010. The main villains of the piece are Australia, Canada, and the United States, which remains the biggest polluter of all. Indeed American emissions of carbon dioxide, far from falling to 1990 levels, may increase by as much as 13% by 2000.

The next significant test will come at the Kyoto meeting of the parties to the Climate Convention in December. A number of ideas are on the table. The prospects do not look good. There is much saving of face among industrial countries, and little giving of example. Yet most of the poorer countries of the world, including China, realise the risks of climate change, not least for one simple reason: the damage such change might do to themselves. This was particularly evident to me in a visit I paid to China at the beginning of this month. We must now all keep our fingers crossed.

- *Conflicts in International Law*

Most of the agreements so far reached lack means of enforcement. The agreements covering ozone depletion are a significant exception. In the future it will obviously be necessary to give international agreement more authority. Yet this is threatened by the parallel development of agreements covering trade through the World Trade Organisation. There are real possibilities of conflict between the two. So far the issues have not been put to the test, but they are bound to come sooner or later. They may also arise over a proposed new international agreement on

investment. Until now the environment has not had a strong central mechanism comparable to the World Trade Organisation, but there is an obvious need for something to act as a counterweight. This was fully recognised by the last government. The German government has proposed the creation of a World Environment Agency. Environmentalists everywhere should in my view support such a proposal, and in the meantime be vigilant in protecting the environmental interest in the event of any conflicts over trade.

The British Approach

Global problems require international agreements and cooperation. But in the environmental field in particular such agreements can only be implemented by effective national, regional and local action. The national level remains the only point at which the various different levels of policy and action in air quality and wider atmospheric issues can be integrated and rendered coherent.

In terms of regulation, British legislation has evolved over the years, ranging from the *Control of Pollution Act 1974*, to the *Environment Protection Act 1990*, to the *Environment Act 1995* (creating the Environment Agency). Incentives and disincentives introduced include price differentials between leaded and unleaded petrol, and the new landfill tax.

The last British Government gave leadership in environmental policy with some ups and downs. It also made efforts to increase public awareness of environmental issues. Educative documents were published, such as *This Common Inheritance* 1990 and successive annual reports from the Department of the Environment, involving targets and a measure of self criticism. Other reports were produced on such issues as air pollution and transport, and a set of indicators to measure environmental performance. In addition outside bodies were created to bring together informed criticism and promote debate. These include the Government Panel on Sustainable Development; the Round Table on Sustainable Development; Going for Green; and Local Agenda 21.

I have a particular interest in the Panel which I chair. From the beginning it has taken up a wide range of environmental issues in annual reports to the Prime Minister. Atmospheric issues have not been neglected. In its First Report, of January 1995, it examined stratospheric ozone depletion. More recently in the Third Report, published last January, it focused on air quality, and the issue of climate change and long-term energy supplies.

National Air Quality Strategy

A key aim of the National Air Quality Strategy, for which the Society campaigned for so long, and which the previous Government published and the present Government adopted, was to integrate policy and action in air quality. One specific objective was to tackle ground-level ozone. I know that the Society will be publishing in the course of this conference its proposals for the further development and review of this Strategy. One of the key themes which I hope the Society will continue to emphasise is the critical importance of ensuring that global concerns are taken into account in national strategies.

The new Government gave further commitment to the issue of air pollution by announcing in June this year that motorists with high polluting cars may soon face roadside checks and automatic fines. Glasgow is one of seven locations for a pilot scheme, which will be initiated in the coming months.

Regional and Local Approaches

We should also recognise the importance of the regional level for sustainable development. If the Government decides to proceed with Regional Development Agencies it is important that the concept of sustainable development be central to their thinking. As the Society has already proposed, the Government should consider the establishment of Regional Sustainable Development Agencies.

The top down approach at international and national levels may provide the legislative framework, buttressed by incentives and disincentives and promotion of public awareness. But, as the Rio Summit recognises, in the first and last resort sustainable development belongs to local communities, and the families and individuals within them, to make it work. Even in as small a country as Britain, there are wide variations, not only between counties but between towns and villages within them. Strong communities produce strong results, and weak communities no results at all.

At the local level, voluntary initiatives under Local Agenda 21 have flourished in recent years. Around 70% of local authorities are now committed to responding to local environmental issues. Indeed I have been involved myself in initiatives in Gloucestershire.

There is a range of sustainable development issues that affect ordinary citizens. Progress in such issues, both big and small, is unlikely unless there is awareness and understanding at local levels. Regional and local government can thus be active through: Local Agenda 21 and other community-based voluntary initiatives; educational and awareness raising activities; developing traffic reduction plans and measures to curb energy use in transport; Environmental Management Systems; and action to improve energy efficiency in the home.

But even voluntary initiatives need a stable framework within which to operate. They need a clear relationship to local democratic institutions. It appears that the new Government has decided against the option of placing all local authorities under a statutory duty in respect of Local Agenda 21 programmes, but this issue is unlikely to go

away. We need to look regularly at the issue of the appropriate relationship between local government and voluntary initiatives.

Conclusions

In trying to cope with environmental problems, the global, national, regional and local levels are - inescapably - interlocking links in a chain. Environmental issues touch the vitals of our society. There is virtually no problem without an environmental aspect. Hence the importance of bringing the environmental dimension into the central processes of decision-making. Governments are increasingly aware of this requirement. Yet many, including some economists, still think and write as if the old rules of their trade still applied. We all need to think anew.

This Society has a more than honourable record over almost a century for bringing together and expressing opinion on the central environmental issues. Pressure from below is almost as important as leadership from above, but we badly need both. We do not want future policy to be made by and through catastrophe. Here is the real challenge to the international community, to governments, and not least to this Society.

NSCA Divisional Meetings

Information about these events is available from Divisional Secretaries. Contact numbers are on page 2.

East Midlands

12 February: Divisional Council Meeting, Kelham Hall

26 February: Visit to British Geological Survey

4 June: Divisional Council Meeting, Kelham Hall

1 October: Divisional Council Meeting, Kelham Hall

Scottish Division

19 February: AGM, seminar on contaminated land

South East

10 February: Divisional Meeting

19 May: AGM

AIR QUALITY

Review and Assessment of Air Quality

NSCA Comments on DETR Consultation Paper

NSCA welcomed the publication of this consultation paper from the DETR. It provides some further clarification of the general principles of reviewing and assessing air quality. It also sets out the information local authorities should collect and collate to complete a review and assessment of air quality and the role of such a review and assessment in local air quality management. The procedures to be followed in cases where a local authority will need to designate an Air Quality Management Area are specifically discussed. The detailed technical guidance which will eventually accompany this document is not yet available.

NSCA welcomes the Government's commitment to implement the new system of local air quality management as quickly as possible. The provision of appropriate guidance to local authorities on the review and assessment of air quality will be of central importance to the successful implementation of the UK National Air Quality Strategy. Overall, the Society supports the general approach to review and assessment set out in the consultation paper. However, without sight of the technical guidance, it is difficult to comment on whether the document strikes the appropriate balance between prescription (the promotion of consistency, specification of the technical factors to be used in AQ assessment, etc) and the need to allow individual LAs sufficient freedom to review and assess AQ in a cost effective manner.

However, it should be remembered that Part IV, Section 88 (2), of the 1995 Act requires only that a local authority "*...shall have regard to any guidance issued by the Secretary of State...*". Paragraph 16 of the consultation paper correctly notes that "*The provisions of Part IV of the Act are largely enabling and, therefore, provide the flexibility which local authorities will need to take local air quality management forward at the local level*". Greater importance should therefore be attached to ensuring that the guidance is sufficiently flexible so as not to frustrate the enabling character of the original legislation.

The current consultation paper is said to "*set out the minimum steps local authorities should take for a review and assessment of air quality*". However, sufficient account does not appear to have been taken of the considerable work already carried out by many LAs in this area. Guidance should make clear that LAs will not be required to needlessly duplicate previous work. Local authorities should therefore be encouraged to use a degree of judgement with regard to at which stage (1, 2 or 3) they should commence their formal AQ review and assessment.

Further consideration is also required as to the relationship between a LA's air quality review and assessment and the authority's other activities. The consultation paper (paragraph 6) correctly identifies ensuring "*...that air quality considerations are integrated into local authorities' decision making processes...*" as one of the primary objectives of the AQ review and assessment process. However, the paper then fails to develop this point further. The guidance should not only indicate how information from the AQ review and assessment should inform the development of local air quality strategies, but also how it should link into the Structure and Local Plan process and be used in the development of TPPs and particular urban packages.

It might also be helpful if the guidance recommended the creation of a steering group as the first step in conducting a review. Where there are both county and district authorities, the active involvement of the county authority from the outset, in such a steering group, should help to avoid difficulties and misunderstandings later on in the process. It should also encourage the most efficient use of available resources and help to ensure that baseline information on population levels and traffic forecasts held by county councils is provided to an agreed specification and timescale.

The need to validate the AQ models used by local authorities is mentioned in the consultation paper, but not explored in any depth. Model validation could potentially be an extremely expensive and time consuming process. This issue will therefore need to be discussed more fully in the Department's forthcoming guidance on the selection and use of dispersion models. NSCA would be prepared to assist with a pre-consultation review of this guidance, under the auspices of the Society's UK Dispersion Model Users' Group, if this was considered helpful.

One further general point: the Society understands that from 1 April 1998 the Highways Agency will transfer the responsibility for the maintenance of trunk roads from County Councils to a number of contracted agencies, and that these agencies will henceforth also be responsible for the collection of traffic flow data for these roads. The Society considers that the Department should place a duty on the Highways Agency to provide to local authorities any such data, required for the review and assessment of air quality, free of charge.

NSCA also made a number of more detailed comments and these are available from the Brighton Office.

Managing Air Quality in Paris

Paris attracted a great deal of interest when, on 1 October 1997, new laws were enforced for the first time restricting traffic movements in and around the city. Parisian air pollution reached alert levels for the first time since legislation empowering the authorities to restrict vehicle movement had been in force. The city of Paris has a very high density of population - 21 000 per square kilometre - and little green space between the narrow streets. In contrast, the administrative region of Ile-de-France in which Paris is situated is 80% fields and forests. The Mayor of Paris is both an elected representative and the appointed officer of the state, however the local authority cannot enforce traffic restrictions - this is the responsibility of the Préfet of Police together with the Préfet of Ile-de-France. In Paris air quality is managed by SPAAS (Service des Pollutions Atmosphériques - Air et Silence). The Department has no enforcement powers.

Since April 1994 a system of information and alert for air pollution has been enforced in Ile-de-France. The table below shows current levels. Future modifications to the system will include particulates.

Level	SO_2	NO_2	O_3	Measures to be implemented
1	200	200	130	Departments and services concerned with air quality informed
2	350	300	180	Public and authorities informed. Residential parking free in Paris[2]. Speed limits on Parisian roads[3] reduced. Tourist buses banned from the two Parisian islands[4].
Alert[5]	600	400	360	Alert message to public with health advice. Traffic restrictions[6] and/or decrease of industrial activities must be enforced by the Préfet. Parisian administrations will lower their number of circulating vehicles. Public services must suspend some polluting activities

1. Values for SO_2, NO_2, O_3 are hourly means in $\mu g/m^3$. For a procedure to be set in motion, at least 2 monitoring stations should be affected. A procedure lasts until the end of the day.
2. Residential parking is FF15/day.(Prior to the October 1997 episode, this has been implemented twice - 8 November 1995, 10 March 1997). Cost to the municipality, FF 400 00/day. Level 2 was reached and free residential parking implemented several times during the summer of 1997.
3. Speed limit is lowered from 80 to 60 km/h on Boulevard Périphérique and from 70 to 50 km/h on expressways along the Seine river.
4. Tourist buses are not allowed on Ile Saint Louis and Ile de la Cité (downtown historic centre around Notre Dame) during July, August and episodes of pollution.
5. Wind speed should be <3m/s in every site to reinforce alert.
6. The principle of this has been reaffirmed in the new *Loi sur l'air et l'utilisation rationelle de l'energie* (30 December 1996). In Paris and three départements nearby, vehicles will be allowed to circulate or not, depending on the number (even or uneven) of the licence plate. Dispensations are defined. An oncoming application of *la Loi sur l'air* would attribute a green sticker to less polluting vehicles, including three-way catalyst cars, and would allow them to circulate at any time. In case of traffic restrictions, public transport will be free (the cost for RATP is evaluated to FF 8-10 millions/day).

Information and Monitoring

Monitoring in Ile de France is carried out by the AIRPARIF Network. It is jointly funded by the French State, Ile de France Council, departements councils, the City of Paris and major local industries. Since July 1995, information on pollution has been displayed on 170 electronic message boards around the city of Paris. Information on air quality is given to the media daily and a permanent exhibition on air is also on display in the city. Ile de France has about 70 monitoring sites; there are three networks - background sites, kerbside sites and sites in crowded areas (e.g. pedestrian areas, outside major buildings). Data from the background sites are used in the information and alert procedure, as this is deemed most representative of population exposure. Eight ozone sites, 19 NO_2 sites and 19 SO_2 sites inform the system. For a procedure to be set in motion, at least two monitoring stations should register exceedences. An alert lasts until the end of the day. The table below shows the number of air pollution episodes experienced in Paris since the inception of the system to October 1997.

Implementation for the Procedure of Information and Alert

Level	1994 (250 days[1])	1995	1996	1997 (304 days[2])
1	22	34	20	31
2	7	6	0	7
Alert	0	2[3]	0	1
Total	29	42	20	39

1. From 25 April
2. 1 January - 28 October
3. Alerts enforced on 10 October 1995 and 8 November 1995

In the episode that precipitated the traffic restrictions on 1 October 1997, still, sunny weather conditions favoured pollution build up. Conditions were anticyclonic with an inversion layer covering the city with very low wind speeds. The weather was sunny with temperatures around 25°C. By Tuesday 30 September a level 3 alert had been reached - NO_2 accumulated in the morning, peaking at midday and dropping afterwards. Moving hourly averages exceeded the threshold of 400µg/m³ in four locations. This led to the Environment Minister Madame Dominique Voynet announcing that restrictions would be enforced on the following day.

Measures taken

- Information on pollution and restrictions for the following day were given on TV, radio and electronic boards.
- The Mayor of Paris announced free residential parking and only priority vehicles were used by the administration.
- Sports were immediately stopped in schools.
- Public transport was free on the whole of Ile de France for the day, at an estimated cost of FF18 million to train, metro and bus operators.
- Speed limits were reduced from 80km/hr to 60km/hr on the Paris ring road.
- Cars and taxis with even number plates or three or more passengers and delivery vans were allowed to enter the city; also taxis, emergency vehicles, farm tractors and other listed vehicles.
- To enforce these restrictions 1000 police officers were deployed. As this was the first time the alert procedure had been implemented, officers simply informed drivers breaking the ban and requested they parked their cars and walked. In future it is planned to issue tickets to transgressors (FF900).
- The largest of three power stations near Paris was taken out of service for the day.

Outcome

- The number of passengers on the Metro and trains increased by about 10%, and on buses by 15%.
- The measures reduced the volume of traffic in central Paris by 17% and on the Périphérique (ring road) by 6%, and 14% around Paris.
- Emissions of NO and CO were reduced. NO_2 levels did not exceed 170 µg/m³.

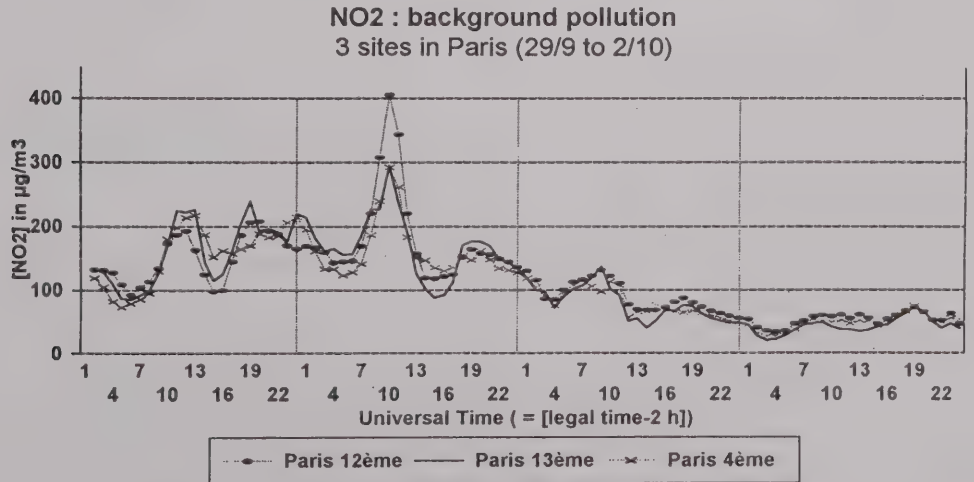
By 2 October the restrictions were lifted. Inspite of increased windspeeds, kerbside CO levels had risen slightly. The graphs show kerbside levels for NO and CO and background pollution levels for NO_2 between 29 September and 2 October.

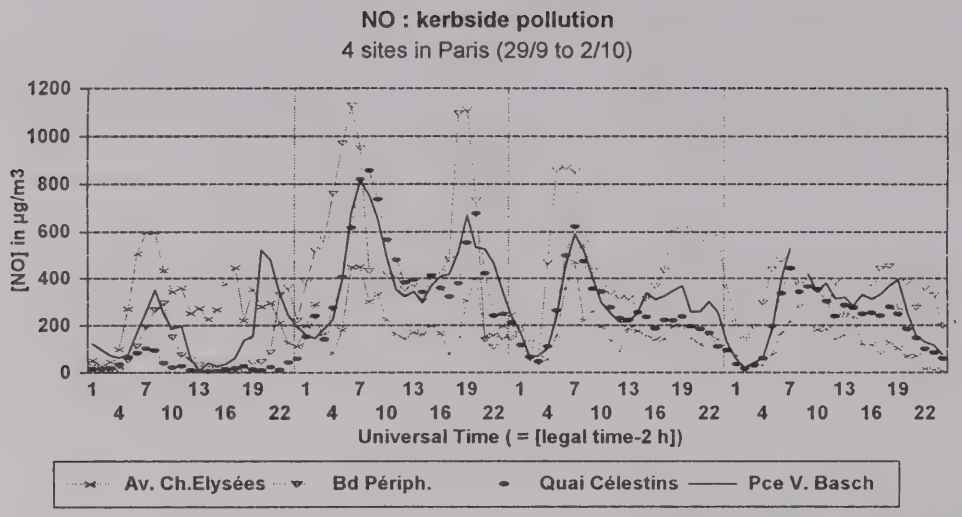
Overall, the action was seen as a success. It was generally well accepted by the public. Excuses for breaking the ban included vehicles having an odd number because they ended in 75 (as do all Paris registered vehicles), and that vehicles ending in 0 were exempt from the law! Pollution levels were reduced, assisted by stronger winds. A survey found that 70% of the population supported a reduction in air pollution.

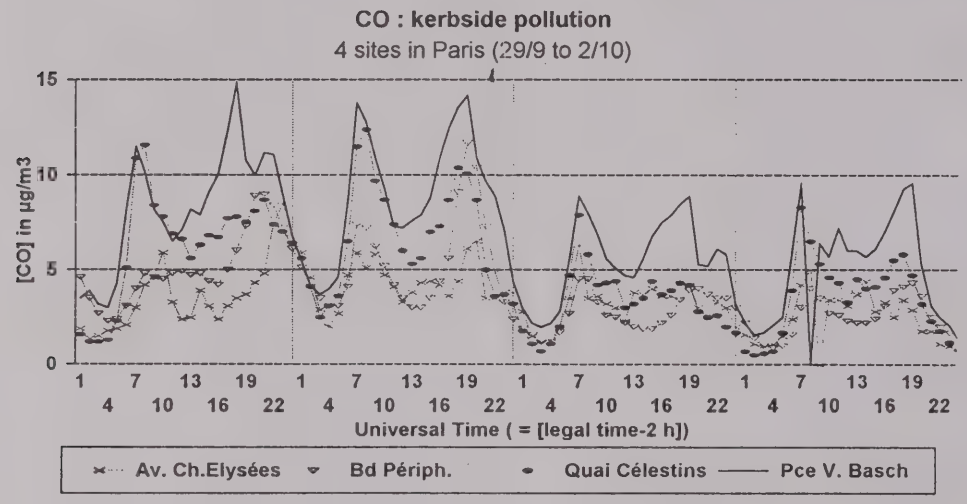
While such measures provide a short term solution to acute air pollution episodes, they appear unlikely to provide any longer term solution. During August Paris is virtually closed as Parisians holiday - consequently traffic is significantly reduced. August 1997 saw a prolonged pollution episode during which level 2 was reached for ozone and level 1 for nitrogen dioxide. Restricting traffic in Paris did, however, once again raise the debate on traffic levels and its effect on air quality on this side of the Channel. *(MS)*

The City of Paris and SPAAS are planning an international workshop for Autumn 1998 on air quality management with invited technical experts from major cities around the world; proceedings from the meeting are to be published.

Further information from: Phillipe Mercier, SPAAS, 7 Rue Maleville, 75008 PARIS Tel: +33(0) 1 45 61 54 70 Fax: +33(0) 1 45 61 54 90 Email: spaas_mairie_paris@compuserve.com



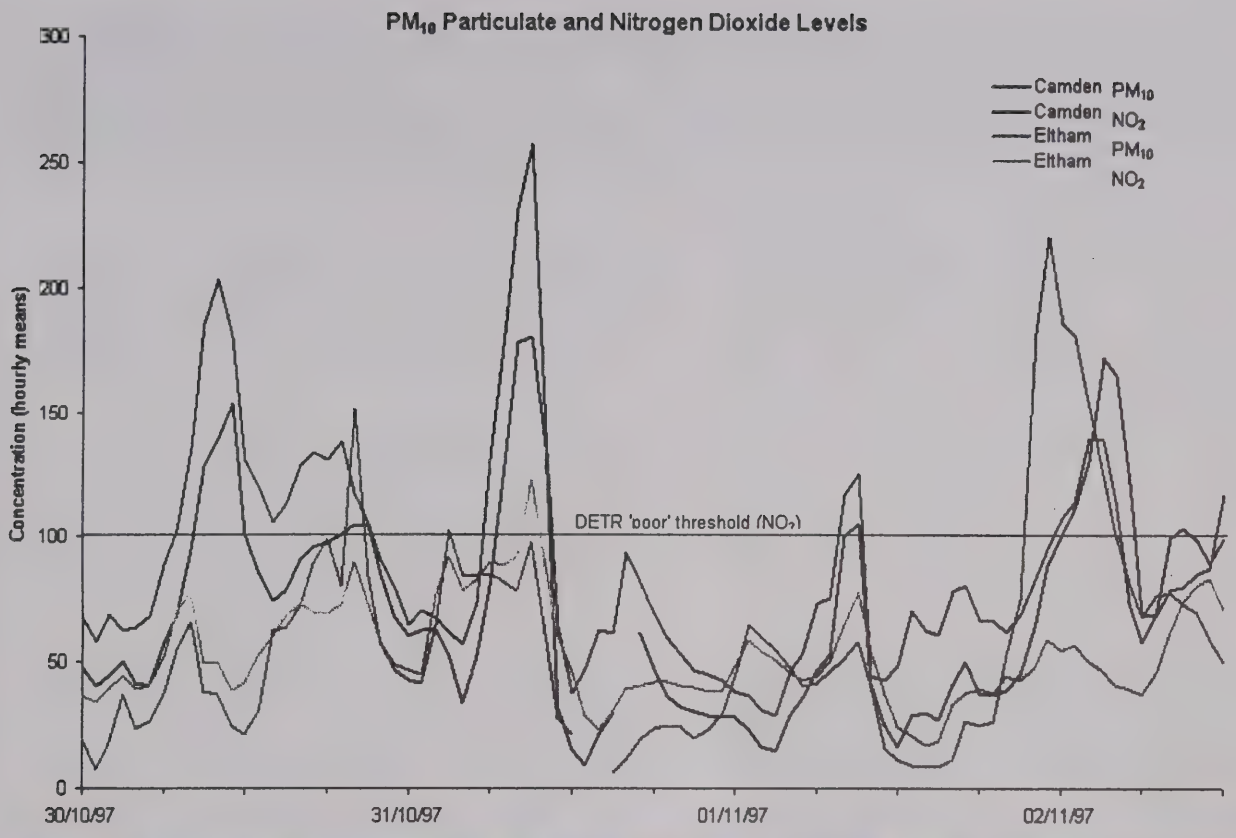




Severe Smog Revisits London

The still sunny October weather had its price - between 30 October and 3 November London experienced its most sever air pollution episode since Christmas 1994. A week of anticyclonic conditions with clear skies and frosty mornings trapped pollutants preventing vertical dispersion. Still conditions prevented horizontal dispersion. The EPAQS standard of 150 ppb hourly mean (287 µg/m^3) for NO_2 was exceeded at 12 sites on the London monitoring network, between 30 and 31 October. Concentrations in excess of 200 ppb (282 µg/m^3) were recorded at Camden, Wandsworth and Southwark equalling the levels that precipitated the recent alert and traffic restrictions in Paris! The EPAQS standard for PM_{10} of 50 µg/m^3 running 24 hour mean was exceeded during most of the period, with smoke from early bonfire night celebrations over the weekend contributing. However, highest pollution levels were recorded on the Friday and Tuesday, in central London and adjacent to busy roads - illustrating the contribution that local traffic made to the episode – see graph page 30. During the period similar levels were experienced in other cities across the UK.

More detailed information from the South East Institute of Public Health website http://www-seiph.umds.ac.uk/envhealth/ehg.htm



UPDATE

EC AIR QUALITY DIRECTIVE

The European Commission has finally published its proposal for a draft Directive setting ambient air quality limit values for sulphur dioxide, nitrogen oxides, particulate matter and lead. This is the first "daughter" Directive arising from the framework Directive on ambient air quality assessment (96/62/EC) adopted on 27 September 1996. The Framework Directive aims to protect human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants; this will be achieved through

- the definition and fixing of objectives for air quality and setting of limit values and/or alert thresholds (and/or target values for ozone);
- assessing air quality in a uniform manner;
- making information available to the public;
- maintaining or improving ambient air quality.

Member States will be required to draw up and implement action plans to achieve the limit values which have been set as follows:

SO_2 350 µg/m³ hourly limit value for health protection; averaging period: 1 hr; no more than 24 exceedances per calendar year; to be met by 1 Jan. 2005.

125 µg/m³ daily limit value for health protection; averaging period: 24 hrs; no more than 3 exceedances per cal. year; to be achieved by 1 Jan. 2005.

20 µg/m³, limit value for the protection of ecosystems; averaging period: cal. year & winter; to be met 2 years after Directive enters into force.

NO_2 200 µg/m³ hourly limit value for health protection; averaging period: 1 hr; no more than 8 exceedances per cal. year; to be met by 1 Jan. 2010.

40 µg/m³ annual limit value for health protection; averaging period: cal. year; to be met by 1 Jan. 2010.

$NO+NO_2$ 30 µg/m³, annual limit value for protection of vegetation; averaging period: cal. year; to be met 2 years after Directive enters into force.

PM_{10} *Stage 1:*

50 µg/m³, 24 hr limit value for health protection; averaging period: 24 hrs; no more than 25 exceedances per cal. year; to be met by 1 Jan. 2005.

30 µg/m³, annual limit value for health protection; averaging period: cal. year; to be met by 1 Jan. 2005.

Stage 2:

50 µg/m³, 24 hr limit value for health protection; averaging period: 24 hrs; not be exceeded more than 7 times per year; to be met by 1 Jan. 2010.

20 µg/m³, annual limit value for health protection; averaging period: cal. year; to be met by 1 Jan. 2010.

Lead 0.5 µg/m³, annual limit value for health protection; averaging period: cal. year; to be met by 1 Jan. 2005.

According to the Framework Directive the Commission must bring forward proposals relating to ozone by 1 March 1998; for benzene and carbon monoxide - no later than 31 December 1997 (proposal now expected early 1998); and for PAHs (benzo-a-pyrene as indicator), cadmium, arsenic, nickel compounds (classified as carcinogens) and mercury - as soon as possible but not later than 31 December 1999.

THE ARITHMETIC OF THE CLIMATE

A recent report from Greenpeace International - *Fossil Fuels and Climate Protection: The Carbon Logic* - outlines the scientific logic for a global multilateral phase-out of fossil fuels. The report highlights the need for immediate action to cut fossil fuel use in the next twenty years as the key to preventing ecosystem and economic damage.

The key findings of the report, based on scientific data from the Intergovernmental Panel on Climate Change (IPPC), are:

- Limits to burning oil, coal and gas must be set long before there is a shortage.
- Estimates of the total oil resource alone are nearly twice the carbon budget needed to prevent dangerous climate change.
- If these limits are exceeded, dangerous climate change such as the destruction of island nations by sea level rises are expected to occur.
- Comparisons with other studies suggest that a rapid phase-out of fossil fuels is technically available through a steady annual decrease in fossil fuel emissions.

RISK ASSESSMENT

Dr. David Slater has retired as Director of Environmental Protection at the Environment Agency to head a joint Agency and DETR Task Force on Environmental Risk Assessment.

The Task Force will take forward the revision of existing risk assessment methodology in time for the publication of the Government's Sustainable Development Strategy. It will also play a key role in establishing the underlying principles for the new Chemicals Strategy.

CYBER CONFERENCE

By convening on the World Wide Web the 7,000 delegates for Environment97, the world's first environmental cyber conference, practised what they preach and saved more than 12 million air miles - the equivalent of 500 trips around the world.

Organised by the Institution of Chemical Engineers (IChemE) on behalf of the Engineering Council, Environment97 held from 3 November, avoided more than 654 tonnes of carbon dioxide from entering the atmosphere by enabling those attending the conference to do so without ever leaving their homes or offices.

All those registering for the Conference were asked where they lived, if they would have attended a "flesh" (yuck!) conference and if so, how they would have travelled there. According to each of the delegates' chosen mode of transport, holding the conference on the Internet has saved a total of: 26,410 walking miles, 33,300 bicycle miles, 33,100 motorbike miles, 627,200 car miles, 69,300 coach miles, 834,400 train miles and 12.45 million air miles.

More than 140 papers were to be presented at the conference, which also featured audio interviews with environmental experts. The conference was fully interactive and delegates were able to voice their opinions and have their questions answered by the speakers.

And for those that are interested, as at 27 October the energy expended running their computer to find out all these things amounted to 2.38 tonnes of carbon dioxide. And for those interested in finding out more about cyber conferencing, contact Uta Bhut at The Communication Group plc, Tel: 0171 630 1411; Fax: 0171 931 8010; Email corporate@tcg-pr.co.uk

MEMBERS NEWS

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

At the NSCA Conference in Glasgow the society's **AGM and Council meeting** saw a number of important changes, and some new faces. **Dame Barbara Clayton** handed over the NSCA President's chain of office to **Sir Crispin Tickell** (see picture). Dame Barbara promised to stay actively involved in the Society as our Immediate Past President. Sir Crispin is Warden of Green College, Oxford and was a member of the Diplomatic Service and British Permanent Representative to the United Nations. Welcoming Sir Crispin's appointment, Richard Mills, NSCA Secretary General said..."Sir Crispin's record as a diplomat and as an advocate for the environment speak for themselves. It is a tremendous honour that Sir Crispin has agreed to serve as the Society's President".

The AGM also elected two new Vice-Presidents: **Professor Richard Macrory**, (professor of Environmental Law, Imperial College, London and member of the Royal Commission on Environmental Pollution) and **Steven Norris** (Director General of the Road Haulage Association and Former Minister for Transport in London).

Meanwhile , Cllr **Jack Carr** of the Yorkshire and Humberside Division is pictured taking over from **Paul Cooney** as Chairman of the Society (below left), with Alderman **Lis Solkhon** (below) of the South East Division stepping up to the position of senior Deputy Chairman. **Keith Horton** of the South West Division was elected as our new junior Deputy Chairman, and **Alan Rees** agreed to continue duties as Honorary Treasurer. Honorary Membership was conferred upon **Jane Inglegfield** and **Jack Simpson**. Jane, a past Chairman of Council, expressed her delight that Lis would following in her footsteps as only the third woman Chairman of the Society!

North East Lincolnshire Council claims to be the first authority to specify the use of natural gas vehicles as a contract condition. The local waste collection contractors have agreed to run all refuse collection vehicles on CNG by February 1998, and the council plans to adapt its own 425-strong fleet of vans, minibuses and trucks over five years.

Horiba Instruments, producers of emissions monitoring equipment, recently celebrated 20 years in the UK. Corporation President Atsushi Horiba joined local dignitaries at the anniversary at which a £70,000 mobile air pollution laboratory was donated to Northampton's Nene College, to help with the nationwide air quality research project. Mr Horiba also announced a £2.5M expansion at Horiba's UK office, effectively doubling its size.

Esso have sold their liquefied petroleum gas retailing business to **Shell UK**. LPG fuelled vehicles look to have a brighter future following last year's budget cuts in fuel duty.

Cheshire County Council is proposing to require companies with more than 20 employees to produce green commuter plans for new developments in Chester. Provision for car parking in the already congested city will be limited, and employers would have to show how they would reduce their impact on traffic by organising company transport and car pooling.

Meanwhile **Cheltenham Borough Council's** new park and ride scheme will be complemented by a people mover land train linking car parks, bus stops and city-centre shops. Three trains will travel a 2km circuit at a leisurely 10mph.

PowerGen is one of the partners in the Powershift project, coordinated by the Energy Savings Trust. The project aims to create orders for 1,000 cleaner fuelled vehicles by offering grants to local authorities and businesses wanting to convert or purchase new vehicles powered by electricity, CNG or LPG.

Divisional News

The **Northern Division** enjoyed a visit to Fujitsu Electronic of Durham, including a presentation on the company's achievement of the ISO14001 Environmental Management System Standard, and a tour of the plant. The Division also elected Keith Atkinson, Len Poole and Peter Loker as Divisional representatives to Council, with Vince Bloxsome nominated as Trustee.

Members of the **West Midlands Division** are shown below on their recent visit to the Coalbrookdale Company. On the extreme right, Divisional Chairman Steve Norman appears to be hiding behind John Hilton of our National Noise Committee!

Elsewhere...

The much loved **NSCA Pollution Handbook** is widely regarded as indispensable by environmental specialists. At a recent seminar one EHO picked up a copy of the Handbook with the words "This is one of the most stolen books in my office!". The 1998 edition will be published in February, with padlock and chain as optional extras.

Don't tell anyone, but the **Met Office** is an executive agency of the Ministry of Defence. This may explain why Doug Middleton's comprehensive new manual on air quality modelling for local authorities is prefaced with a cautionary note: "This paper has not been published".

The Glasgow Conference included a very enjoyable Scottish Evening, complete with a ceilidh dance band. Many brave delegates dressed in kilts for the occasion and a wild time was had by all. Our 1998 Conference is at Weston Super Mare, and members of the South West Division are already considering what sort of ethnic Somerset-style entertainment should be on offer. **Morris dancing** on the legendary Weston mudflats? Suggestions on a postcard please, to Keith Horton at North Somerset Council.

BOOKS & REPORTS

Handbook on Air Pollution and Health. *Department of Health, Committee on the Medical Effects of Air Pollutants. ISBN 011 322096 0. The Stationery Office, £19.95.*

This book provides an introductory account of the effects of air pollutants on health, drawing together recent reports from the DOH's Advisory Group on the Medical Effects of Air Pollution Episodes and the Committee on the Medical Effects of Air Pollutants. It summarises the work of the various committees advising the Government on air pollution and the effects of individual pollutants on health. Included in the appendices is a list of current research into air pollution and health issues and a summary of EU and WHO air quality standards and guidelines.

Caring for our Future: Action for Europe's Environment. *European Commission. ISBN 92-828-1367-3. Office for Official Publications of the European Communities, L-2985 Luxembourg.*

Sub-titled "25 issues at a glance", this document aims to raise awareness of environmental issues among EU citizens enabling them to form a critical view of their own actions, the issues at stake and the precise responsibility of each player. For each issue the basic facts and trends are outlined, followed by a summary of action already taken by the EU and those proposed. Issues covered include energy, agriculture and forestry, hazardous and industrial waste, municipal waste, air quality and issues connected with climate change.

Electromagnetic Radiation - a Guide for Environmental Health Officers. *1997. £20 (cheques only, made payable to BGS Monitoring Committee). Available from Adrian Gardner, Principal EHO, Taunton Deane Borough Council, Environmental Services, The Deane House, Belvedere Road, Taunton, Somerset TA1 1HE.*

This Guide provides a useful, compact summary of the current state of knowledge regarding electromagnetic fields and their potential health effects.

The remit of the Bristol, Gloucestershire and Somerset Environmental Protection Committee in producing the document is to provide an opportunity for the co-ordination and mutual participation in data collection and information sharing in this field.

The Guide begins with the basic principles of both electric and magnetic fields; their physical properties, measurement and physical effects on the human body. A summary is given on the latest research, both in the UK and mainland Europe, into the possible links between exposure to electromagnetic fields and cancer - and concludes that the jury is still out on the epidemiological issues, whilst further study currently underway in the UK will help to clarify the results.

An effective comparison is drawn between the relative health risks associated with electromagnetic fields and those of smoking, and a useful table summarises the current European Standards with respect to exposure levels. The final two chapters outline existing policies. Court cases and possible planning approaches, providing good advice to local authorities and recommendations for planning policies where existing or new build is to be located near to potential electromagnetic field sources.

FUTURE EVENTS

1-3 MARCH - The Environment: A Consumer Choice

This conference will look at ways to increase public interest and participation in more environmentally sustainable lifestyles, particularly issues surrounding recycling and waste minimisation.

Venue: City Hall, Cardiff.
Details: Save Waste & Prosper. Tel: 0113 243 8777. Email: swap@geo2.poptel.org.uk

18-21 MAY - Atmospheric Dispersion Modelling

Fifth international conference on harmonisation within atmospheric dispersion modelling for regulatory purposes.

Venue: Rhodes, Greece.
Details: John Bartzis, INTRP/Environmental Research Laboratory, 15310 Aghia Paraskevi Attikis, Greece; Fax (+30 1) 6533431; Email: 5harmo98@avra.nrcps.ariadne-t.gr

31 AUGUST - 2 SEPTEMBER - Urban Transport & the Environment for the 21st Century

Fourth international conference providing an opportunity for the exchange of information among all those working on urban transport studies and those involved with transport policy.

Venue: Lisbon, Portugal.
Details: Wessex Institute of Technology. Tel:L 01703 293223; Email: Paula@wessex.ac.uk

13-18 SEPTEMBER - 11th World Clean Air & Environment Congress

The contribution of developing countries to regional and global air pollution is likely to become increasingly significant; while developing countries may take note of environmental management and technology of developed countries, it is important for them to maintain sustainable development. However, the interface between developing and developed countries must bring about the evolution of appropriate international environmental management.

Convened by the International Union of Air Pollution Prevention and Environmental Protection Associations (for which NSCA provides the secretariat), and hosted by the National Association for Clean Air, South Africa.

Venue: Durban, South Africa.
Details: Ammie Wissing, PO Box 36782, Menlo Park, 0102 South Africa. Fax: +27 12 348 1563. Email: wissing@iafrica.com

FORTHCOMING NSCA EVENTS

Tuesday 10 February 1998
Training Seminar - NEC Birmingham
Implementing Air Quality Management

Thursday 26 - Friday 27 March 1998
Spring Workshop - Abingdon
Air Quality Review and Assessment

Wednesday 10 June 1998
Workshop - London
UK Dispersion Model Users Group

Tuesday 16 June 1998
Training Seminar - NEC Birmingham
Effective Transport Measures for Air Quality Management

Tuesday 15 September 1998
Training Seminar - NEC Birmingham
Noise Update 98

Monday 26 - Thursday 29 October 1998
Weston-super-Mare
Environmental Protection 98

For list of forthcoming
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CLEAN AIR
AND ENVIRONMENTAL PROTECTION

March/April 1998

- Local Air Quality Management: Experience from first phase authorities
- Developments in AQ standards
- Determining grossly polluting vehicles

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CONTENTS

The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

NATIONAL SOCIETY FOR CLEAN AIR AND ENVIRONMENTAL PROTECTION
(Founded 1899)
Registered Charity, Number 221026

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EDITORIAL

First Phase Authorities Lead The Way

This edition of *Clean Air* features a series of short reports on the work undertaken by First Phase authorities around the country. The work has been undertaken to a tight timetable, with the dual purpose of testing out the science underlying local air quality management, and developing the practical guidance which DETR will issue to local authorities.

The timetable has slipped somewhat. One of the lessons of the first phase research is that the practical groundwork - setting up monitoring stations, getting hold of emissions data, or establishing new working relationships - takes a lot longer than anyone would have predicted. The mundane problem of getting planning permission for a hut from your own planning department has almost reduced some officers to tears.

Getting the science right whilst simultaneously testing out draft guidance has proved an interesting juggling act, but the process has been worthwhile. Much of the work has been ground-breaking. Anomalies in the guidance have been ironed out, whilst some areas of research have produced important new evidence - for instance on the source and distribution of fine particles. DETR have rightly been concerned to get the guidance right, whilst wanting to give LAs the information they need to implement local air quality management as soon as practicable. This has been a race against time for officials in both national and local government, and it is to their credit that LAQM is still on track.

The UK intends to make air quality one of the top policy priorities for its current Presidency of the European Union - indeed NSCA will be hosting a conference in June to highlight the issue. Much of the conceptual thinking behind the Air Quality Framework Directive came from the UK, and we are now showing how it can be made to work on the ground.

FIRST PHASE AUTHORITIES

As a result of commencement of the remainder of Part IV of the Environment Act 1995 on 23 December 1997, all district and unitary authorities in England, Scotland and Wales are now under a duty to review and assess air quality in their area; Any part of the authority's area in which air quality objectives (as set out in the Air Quality Regulations 1997) are not being met, or are unlikely to be met over the period to 2005, should by Order be designated an Air Quality Management Area.

During 1996-1997, local authorities in 14 areas were funded by the (now) Department of the Environment, Transport and the Regions to test various elements of the review and assessment procedure, and to assess the DETR's draft review and assessment guidance.

Clean Air invited all the first phase authority coordinators to provide a brief summary of what they were asked to do and to report their experiences in the expectation that these would be of both interest and help to other local authorities. Thirteen authorities responded to our invitation; we also include a report on behalf of Belfast City Council which, while not strictly a first phase authority, was funded by the DETR to carry out a comparison of samplers for PM_{10}.

Clean Air thanks all the authors of the following reports for their contribution to this issue of the journal.

Aberdeen City Council

Introduction

Aberdeen City Council was set three tasks by DETR:

1. Establish a continuous monitoring station at the kerbside in a busy city centre, preferably in a congested street canyon, to record levels of PM_{10}, NO_2 and CO.
2. Model the level of pollutants at the side of a congested street canyon and compare modelled values with continuous measurements.
3. Assess the value of a small scale emission inventory in the city centre of Aberdeen as a means of assessing levels of PM_{10} and NO_2.

1. Establishing a Continuous Monitoring Station

This first task required the identification of a suitable location for a kerbside monitoring station. The most suitable site in terms of traffic flow and population exposure was on Union Street, the city's main shopping area; however restrictions imposed by the Council's Planning and Roads Departments excluded several suitable sites. Practical problems included a lack of available pavement width and the location of bus stops, street furniture and underground services. Furthermore few retail premises were agreeable to a large 'box' being sited in front of their shop frontage. Only through the co-operation of Council Departments and local businesses could a site be agreed and the project proceed.

The station was installed in March 1997 and no major problems have been encountered despite staff having limited previous experience in air quality monitoring. Software limitations were encountered, particularly because fortnightly calibration data could not readily be applied to scale raw measurements.

Pollution levels from March-September 1997 generally complied with the standards specified within the Air Quality Strategy with the exception of a few limited exceedances. Levels of PM_{10} exceeded 50 $\mu g/m^3$ as a running 24 hour measurement on occasions, most noticeably in August when the weather was warm, dry and calm. Similarly, the 1 hour NO_2 level exceeded 150 ppb on occasions. A strong correlation between weather conditions and pollution concentrations was noted. Exposure to pollutants at the kerbside is short term and advice on the applicability of standards at such locations is recommended.

2. Model Levels of Pollutants and Compare with Continuous Measurements

Aberdeen City Council elected to test the Dutch CAR International and Met Office's AEOLIUS models in-house as both are simple to operate. The Met Office was contracted to assess the more sophisticated ADMS and CALINE 4 models. All the models underestimated pollution concentrations and generally showed poor correlation with monitoring station measurements. This may in part be explained by the use of meteorological information from Aberdeen Airport (which although only 7 miles distant, has significantly different weather conditions from the city centre), traffic characteristics in the vicinity of the monitoring station and the complexity of pollution dispersal in the city centre.

The need for accurate input data was considered particularly relevant to enable a comparison between methods.

3. Assess Value of Small Scale Emission Inventory as Means of Assessing Levels of PM_{10} and NO_2

Undertaking a small scale emission inventory covering 10 km^2 of the city centre was a time consuming process and provided limited information. Consideration was given to all point sources, EPA authorised processes, small diffuse sources and rail, shipping and traffic movements. Insufficient data was available from many point sources and no information was available on small diffuse sources. Difficulties were encountered in processing the data to calculate emission rates and representing the information in a meaningful format. Computer model was considered necessary in this respect. Staff were of the opinion that it would have been more productive if resources had been concentrated on obtaining accurate traffic information as vehicle emissions are the main source of pollution in the city.

Conclusions

The study was considered worthwhile as it both provided further data on air quality in Aberdeen and highlighted some of the difficulties small to medium sized cities are likely to encounter in undertaking an air quality review and assessment. The completion of all the tasks took considerably more time than first anticipated and required a significant amount of technical expertise. It is therefore important that local authorities identify both staffing and financial resources at an early stage. The involvement and co-operation of all relevant Council Departments, Environmental Agencies and other relevant organisations was essential.

Further Information

Further information can be obtained from Aileen McDiarmid of Aberdeen City Council, Environmental and Consumer Protection Services Department, St. Nicholas House, Broad Street, Aberdeen, Tel: (01224) 522065.

Avon

Introduction

On the face of it the tasks set for the four unitary authorities which replaced Avon County Council (Bristol, Bath & North East Somerset, North Somerset and South Gloucestershire) comprised the shortest section in the pilot programme although the funding was the largest to any project with the exception of London. The tasks, in addition to the general requirements, were:

1. To monitor hydrocarbons, especially benzene and 1,3-butadiene, in the Avonmouth industrial area using both continuous and non-continuous methods.
2. To identify and quantify significant sources of benzene, 1,3-butadiene and sulphur dioxide (SO_2) in the Avonmouth area and model the impacts of these on the surrounding area.
3. To model and assess levels of oxides of nitrogen, PM_{10} and carbon monoxide at the kerbside of the automatic stations in Bristol and Bath using a range of simple and complex models.

In addition Bristol also offered to include some work on the spatial distribution of PM_{10} in urban areas as this was already underway (reported on as 4 below).

Problems Encountered

In any exercise of this nature it is inevitable that problems will be encountered even by people with considerable experience in the field. Four main areas can be identified easily:

- negotiating access to desired sites for continuous monitoring;
- equipment performance;
- delays in delivery of equipment and software; and
- IT sections.

The first three of these are more or less self-explanatory but the problems with IT sections are worthy of some detail. The basic problem appears to be a lack of understanding that the work was subject to timescales and contractual obligations. This was compounded by the fact that IT sections have a somewhat blinkered attitude to the requirements of complex models in terms of memory and disk space. A further problem is that IT sections are usually wedded to the ideas of having a corporate standard for hardware and software, an approach which is often incompatible with the needs of a project of this nature, partly on grounds of cost and partly on grounds of technical capability. A final point is that there is sometimes a question as to who is the service provider and who is calling the tune.

Results

1. Monitoring Hydrocarbons

As a result of operational problems few data have yet been obtained from the continuous hydrocarbon monitoring but the outcome of the passive sampling exercise has produced some useful results, especially when other data from ambient and special surveys are considered as well. A long term (two year) study on and around petrol station forecourts in Bristol has produced sound evidence of the characteristics of benzene, toluene and xylene in evaporative emissions of petrol and from vehicle exhausts. Figures 1 - 4 illustrate concentrations of these three at a range of sites (F = forecourt site). It is immediately apparent that there is a higher proportion of benzene in the evaporative emissions and that long term average concentrations of benzene on large petrol station forecourts with 24 hour operation can be as much as six times the EPAQS recommendation. The maximum average for a two week period was 55.8 ppb and the minimum was 9.8 ppb. These concentrations, however, fell off very rapidly with

distance. In Avonmouth the highest concentrations were found downwind from a tanker filling installation where the average concentration for the period of the exercise was 8.1 ppb. Reproducibility of results was tested by exposing three tubes simultaneously at four of the sites. These showed a good agreement for all three substances and in particular for benzene as is illustrated in Figure 5.

2. Sulphur Dioxide

Continuous monitoring of sulphur dioxide was carried out in the vicinity of the smelter complex in Avonmouth using a mobile monitoring facility which also monitored oxides of nitrogen, carbon monoxide and PM_{10}. This showed that there would be many exceedances of the EPAQS recommendation in the vicinity of the smelter. It is probable that many of these are due to fugitive emissions. This clearly represents a problem area for compliance with the standards which are included in the *Air Quality Regulations*. Results for sulphur dioxide and PM_{10} as 15 minute averages are shown in Figure 6.

3. Modelling

A range of models were tested including some simple screening models and three sophisticated models, INDIC (both Gauss and Grid models), ADMS Urban and Fluidyn Panache. Because of the problems encountered in part with computers and in part with delivery times it was not possible to fully evaluate these three to the extent that would have been ideally desirable but some conclusions, both general and specific, can be drawn from the experiences gained.

In the case of the two INDIC models the more sophisticated Grid model gave outputs which were much more realistic than those from the Gauss model. The former predicted higher NO_2 concentrations along the lines of major roads whereas the latter merely identified a broad area of higher concentrations around the centre of the city.

In the case of ADMS Urban problems were encountered with computer stability even with a powerful system with ample memory. Outputs again appeared to be realistic.

Less work was possible on the fluid dynamic Fluidyn Panache model as there were delays in delivery and problems with running the model as at present it does not run under Windows 95 or Windows NT. In theory this appears to be a model which will work well in complex micro-environments.

4. PM_{10} Assessment

Since the establishment of the (then) Enhanced Urban Network (EUN) in 1992 the number of national network sites where PM_{10} is monitored in real time has grown to 46 with a range of types of location from remote rural (Lough Navar) to kerbside (London A3 and Marylebone Road). This has made it possible to look at PM_{10} in some detail although many of the datasets are very short and some of the data analysed are still provisional. From these data there is evidence that typical concentrations of PM_{10} in the different types of location are as given in the table below.

Site type	*Typical PM_{10} concentration ($\mu g/m^3$)*
Remote rural	10.00
Rural	15 - 20
Urban background	25.00
Roadside	30 - 35

Detailed studies of timeseries data show that there are occasions when long range transport of particles contributes to exceedances of the EPAQS recommendation with $PM_{2.5}$ predominating in the total particles. PM_{10} data are illustrated in Figures 7 and 8.

Conclusions

- Air quality assessment in urban areas, especially those with heavy industry, is not likely to prove to be an easy task;
- sulphur dioxide will continue to be a problem especially where there are fugitive emissions;
- PM_{10} will also be a long term problem both from local emissions and from long range transport;
- evaporative sources of benzene, toluene and xylene may be distinguished from exhaust emissions by the ratios of benzene concentrations to the other two;
- road traffic is a major, but exclusive source of urban air pollution.

Further Information

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Figure 1: Avonmouth Hydrocarbons (Average Concentrations)

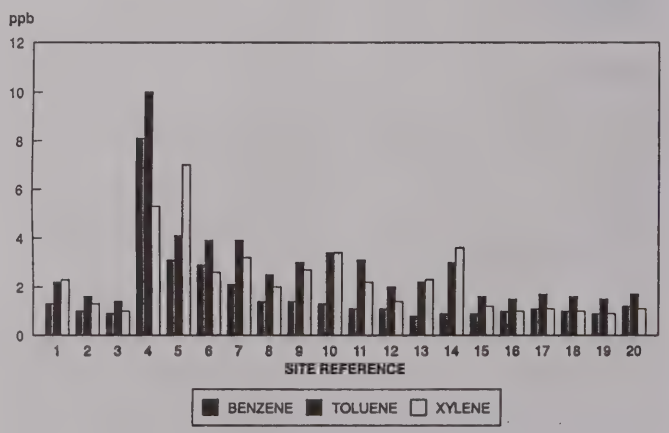


Figure 2: Petrol Station Hydrocarbons (Average)

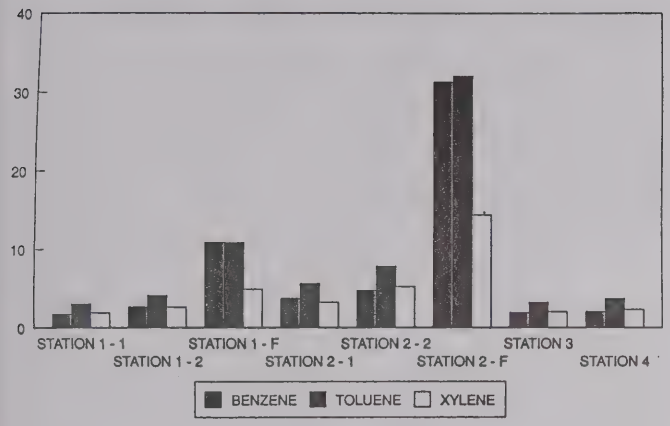


Figure 3: Avonmouth Hydrocarbons (Ratio of Benzene : Toluene)

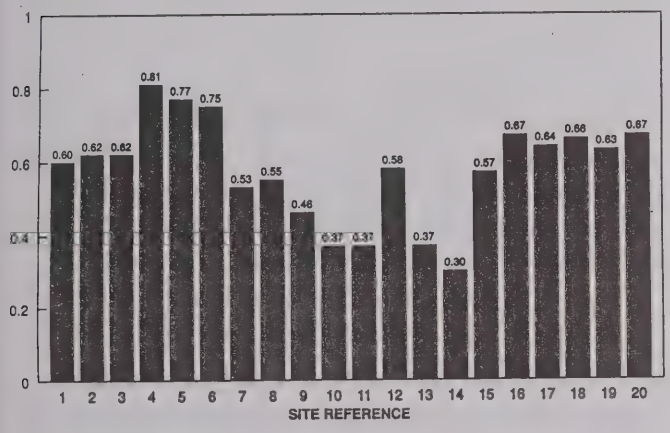


Figure 4: Benzene: Toluene Ratios (Petrol Stations - top and Roadside sites)

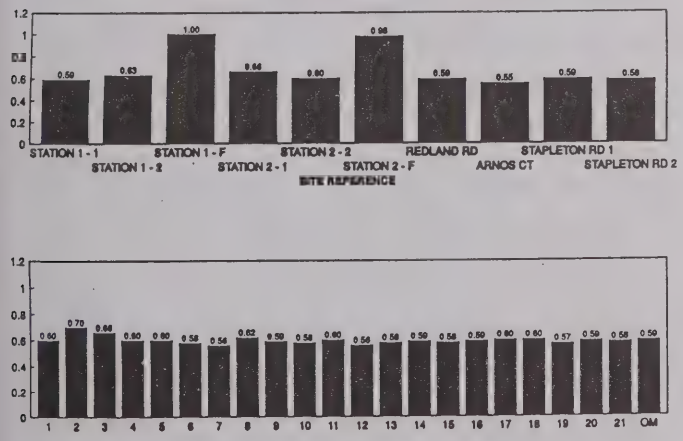


Figure 5: Avonmouth Hydrocarbons (Ratio of Maximum : Minimum Conc. Simultaneously Exposed Tubes

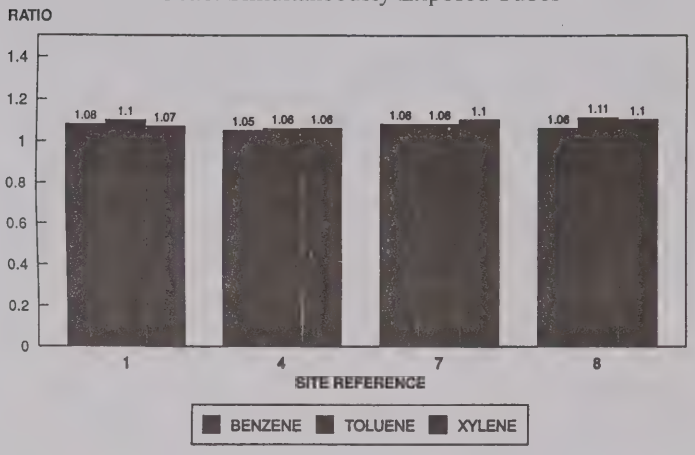


Figure 6: Avonmouth SO_2 and PM_{10} (February 1997)

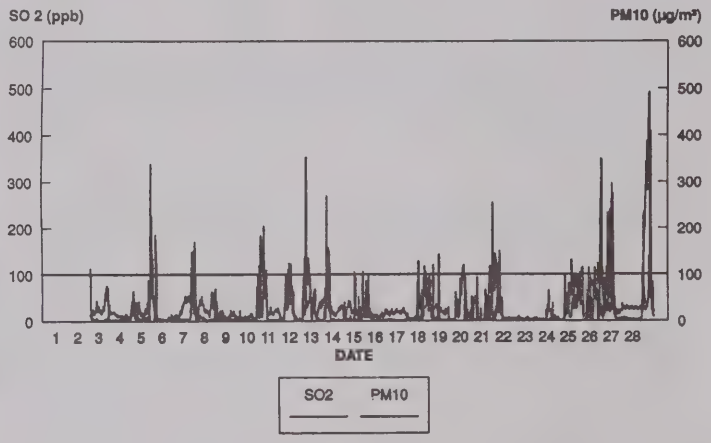
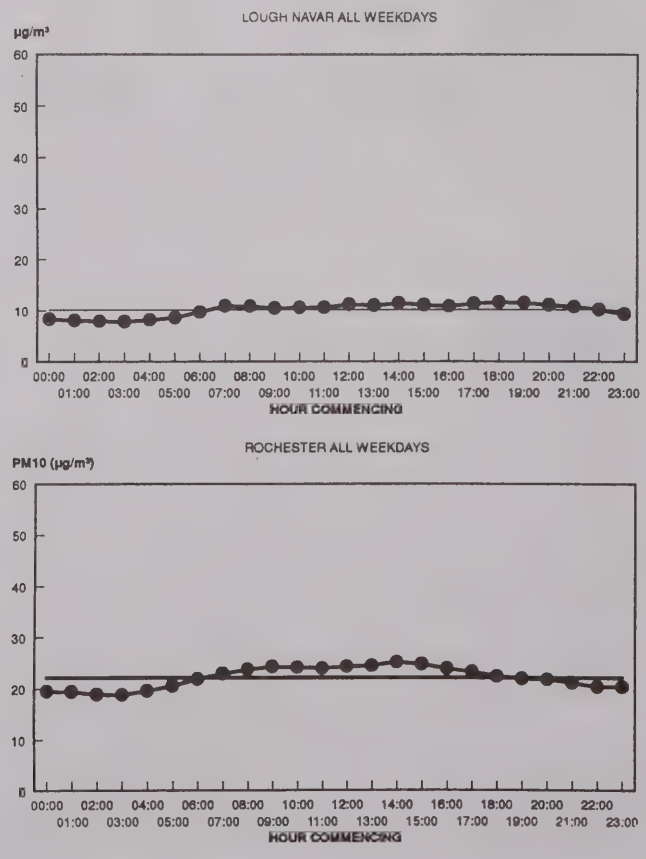


Figure 7: Diurnal PM_{10} Concentrations



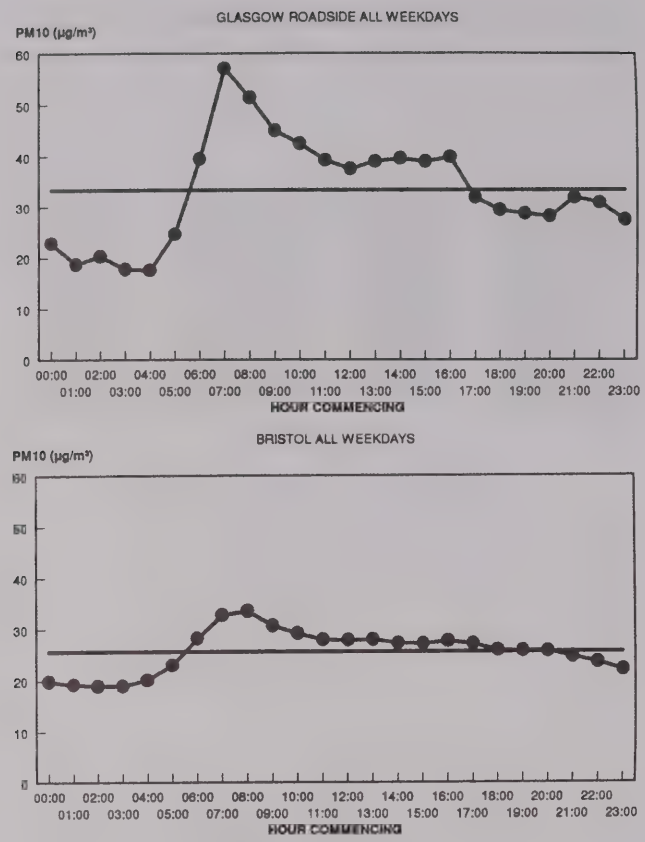
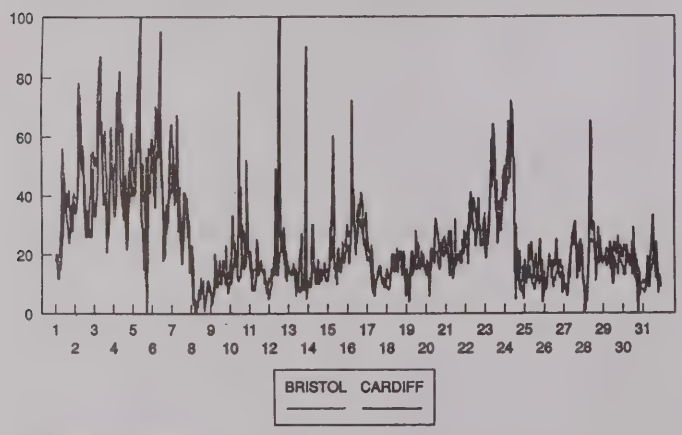


Figure 8: PM_{10} Concentrations (May 1995)



Belfast

Introduction

Exposure to fine airborne particles has been associated with a range of health effects, from coughs to premature deaths. There is no evidence of a threshold for these effects. PM_{10} (particulate matter less than 10 micrometres aerodynamic diameter) has become the most common measure of fine airborne particles, although in future attention may well focus on $PM_{2.5}$ and smaller. The UK National Air Quality Strategy[1] (NAQS) has set a standard for PM_{10} of 50 µg/m³ over a running 24-hour period, with the objective of meeting this on all but four days in a full year by 2005 (99 percentile). The European Commission has also issued a draft Directive, which aims at a limit value for PM_{10} of 50 µg/m³ over 24 hours on all but seven days a year (98 percentile) by 2010, and an annual mean of 20 µg/m³.

Measurement of PM_{10} in a consistent reproducible way will be crucial to enforcement of the NAQS objective and the EC Limit Value. There are a number of methods for measuring PM_{10}, but little work has been carried out to determine the comparability of these techniques. As part of the development of Guidance for implementation of Local Air Quality Management under the NAQS, the Department of Environment, Transport & Regions (DETR) funded various projects, including some on the measurement methods for PM_{10}. One of these studies was carried out by Belfast City Council and involved a three month study of the performance of three co-located samplers for fine airborne particles. Air Quality Consultants Ltd was contracted to analyses the findings, which are reported in this paper.

Monitoring Programme

The programme has involved sampling for PM_{10} using:

- a Tapered Element Oscillating Microbalance (TEOM) analyser, which provides hourly concentrations;
- a Partisol sampler, which collects sample on a filter on a daily basis.

In addition consideration was given to the role of daily smoke measurements using an eight-port sulphur dioxide and smoke sampler, as a surrogate for PM_{10} (black smoke concentrations were calculated using the British Standard calibration curve). Sampling took place between 2 January and 14 April 1997, at the Automatic Urban Network (AUN) site in central Belfast, where the three samplers were co-located.

Analysis of the data has involved use of a statistical approach appropriate for a method comparison study (regression analysis is not appropriate as neither sampling method can sensibly be treated as the independent variable. Correlation analysis is also insufficient as an analysis tool). The approach has involved an examination of the differences between paired samples as a function of the mean. TEOM concentrations were derived from the hourly data to match the daily sample period for the Partisol as closely as possible. Separate daily TEOM values were calculated to match the different time period of the Black Smoke sampler. A comparison between Partisol and Black Smoke has not been possible because of the mismatch in the time periods.

Results

There is clearly a broad agreement between the Partisol and the TEOM, especially when averaged over the whole period (Figure 1). Indeed, the mean concentrations for the full three and a half months were almost identical, 34.3 µg/m³ for the Partisol and 33.9 µg/m³ for the TEOM. However, there are some major discrepancies on a day to day basis, as revealed in the scatter in the results (Figure 1).

The Black Smoke method, on the other hand, produces concentrations considerably below those measured using the TEOM. On average the Black Smoke concentrations are 44% of those measured using the TEOM. This is not surprising, as the Black Smoke method is measuring a different component of the fine airborne particles, and the calibration curve to translate the reflectometer reading to microgrammes per cubic metre was derived when domestic smoke was the principal source.

Differences Between Samplers

A more detailed analysis of the agreement/disagreement between samplers is presented in Figures 3 a-d, where the difference between the pairs of time matched samples are plotted against the average for that pair. One set of plots (a & c) is for the absolute difference in microgrammes per cubic metre ($\mu g/m^3$), the other (b & d) is for the relative difference (difference as a percentage of the mean). These plots make it easy to examine the nature of the disagreement (and agreement) between the methods, showing:

- whether there is any bias between the two methods;
- whether the bias depends on the concentration;
- whether the differences are dependent on concentration in an absolute or relative sense;
- the variability of the differences.

Consideration of the differences between the Partisol and TEOM results shows that, while there is no overall bias, there is a tendency for the Partisol to read slightly lower than the TEOM at low concentrations and higher at high concentrations both in absolute and relative terms (Figure 3 a & b). This has implications for the number of exceedances of a daily concentration of 50 $\mu g/m^3$. During the three and a half months there were 21 daily exceedances of 50 $\mu g/m^3$ for the Partisol and 13 for the TEOM. This tendency for the TEOM to under-read against the Partisol at high concentrations is also seen in the results of a study in the London Borough of Greenwich[2]. The same pattern is found in data collected in California, where the TEOM was compared with a High-Volume sampler. The TEOM over-read against the High-Volume sampler at low concentrations and significantly under-read at high concentrations[3]. Seasonal differences were also found in the agreement between samplers.

Another feature of the results is that the variability of the differences between Partisol and TEOM tends to increase in an absolute sense with increasing concentration (Figure 3a), but is more constant in relative terms (Figure 3b). Examining the standard deviation of the differences (and ignoring the variable bias) shows that the agreement between the two methods for daily samples was within ±84% (95% limits). Thus at an average concentration of 20 $\mu g/m^3$ the difference between Partisol and TEOM would generally be less than 17 $\mu g/m^3$, while at 100 $\mu g/m^3$ the difference would generally be less than 84 $\mu g/m^3$. These differences, however, could be either way, thus at the higher concentration the values could range from TEOM = 142 $\mu g/m^3$ and Partisol = 58 $\mu g/m^3$, to TEOM = 58 $\mu g/m^3$ and Partisol = 142 $\mu g/m^3$. These differences are sizeable and demonstrate poor agreement between the Partisol and TEOM results on a daily basis. This finding has important implications for the use of daily PM_{10} data in epidemiological studies, as the definition of high PM_{10} days for comparison with health statistics will depend on the sampler used.

The differences between Black Smoke and TEOM results demonstrate the clear negative bias of the Black Smoke method as against the TEOM (Figure 3c & d). The absolute magnitude of the differences increases with increasing concentration (Figure 3c), but becomes less significant in relative terms at higher concentrations (Figure 3d). In other words, the disagreement is less significant (or the agreement is better) in relative terms at higher concentrations. Taken overall, and ignoring the change in bias with concentration, the results show that differences between the two methods generally lie within the range -6% and -166% (95% limits). These results show that there is poor agreement between the Black Smoke and TEOM results both on average and on a daily basis. Similar findings have arisen in other studies, which have shown that the difference between samplers varies from location to location and also from summer to winter[4,5].

Summary and Conclusions

- A comparison of three sampling methods for fine airborne particles has been carried out using co-located samplers in the centre of Belfast over a three and a half month period. Daily concentrations were calculated using matching time periods for a Partisol sampler; a TEOM analyser; and a Black Smoke sampler. The results have probably raised more questions than they have produced answers.
- Averaged over the whole of this winter period, the Partisol and TEOM showed remarkably close agreement, with mean concentrations of 34.3 and 33.9 $\mu g/m^3$ respectively. However there were considerable differences on a day to day basis.
- There was evidence that the Partisol has a tendency to produce slightly lower concentrations than the TEOM when concentrations are low and higher concentrations than the TEOM when concentrations are high. This is particularly significant when counting exceedances of a 24-hour concentration of 50 $\mu g/m^3$. Thus, during the sample period there were 21 daily exceedances of 50 $\mu g/m^3$ for the Partisol and 13 for the TEOM.
- The Partisol cannot be considered to be a good indicator of TEOM concentrations on a day to day basis. Similarly, the TEOM cannot be considered to be a good

indicator of Partisol concentrations on a day to day basis. There are clear risks in using the two methods interchangeably. The UK has de-facto adopted the TEOM as the standard PM_{10} sampler, because at the time of its introduction it was the only instrument available offering 1-hour time resolution, as well as other advantages over the manual methods. It remains to be seen, however, whether the TEOM is acceptable in relation to the proposed new EU Directive, which sets as the reference method a high volume gravimetric sampler, which may be closer to the Partisol in performance than the TEOM.

- The present results are consistent with those of other studies. Under-reading of the TEOM against the manual methods is attributed to the loss of volatile nitrates and VOCs at the higher temperature at which the TEOM filter is held.
- The Black Smoke sampler gives concentrations considerably lower than those produced by the TEOM. The disagreement is less in relative terms at higher concentrations, but is substantial on a day to day basis at all concentrations. The agreement between Black Smoke and TEOM measurements is therefore poor under all circumstances. Separate studies have shown that the TEOM : Black Smoke relationship is variable from site to site and differs from summer to winter. This would suggest that Black Smoke measurements are unlikely to be very helpful for local authorities reviewing air quality in relation to the NAQS PM_{10} standard and objective.
- The results of this study demonstrate that caution should be exercised in handling results obtained using different PM_{10} samplers. Further work is clearly required before unambiguous advice can be given as to which samplers are suitable for measurement of PM_{10}.

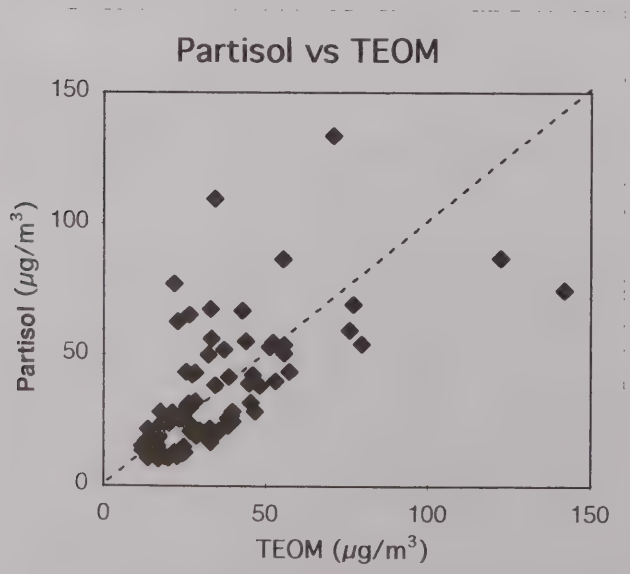


Figure 1 Daily Partisol Against TEOM
Also shown is 1:1 line

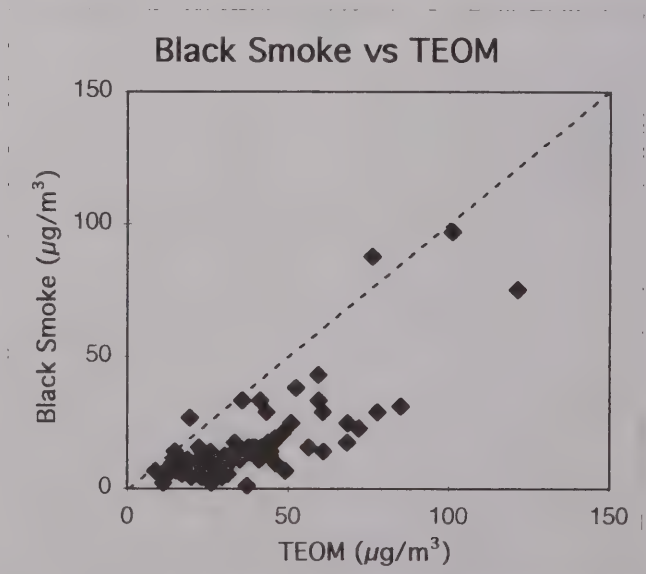


Figure 2 Daily Black Smoke Against TEOM
Also shown is 1:1 line

Further Information

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The views expressed are those of the author and not necessarily those of any other organisation.

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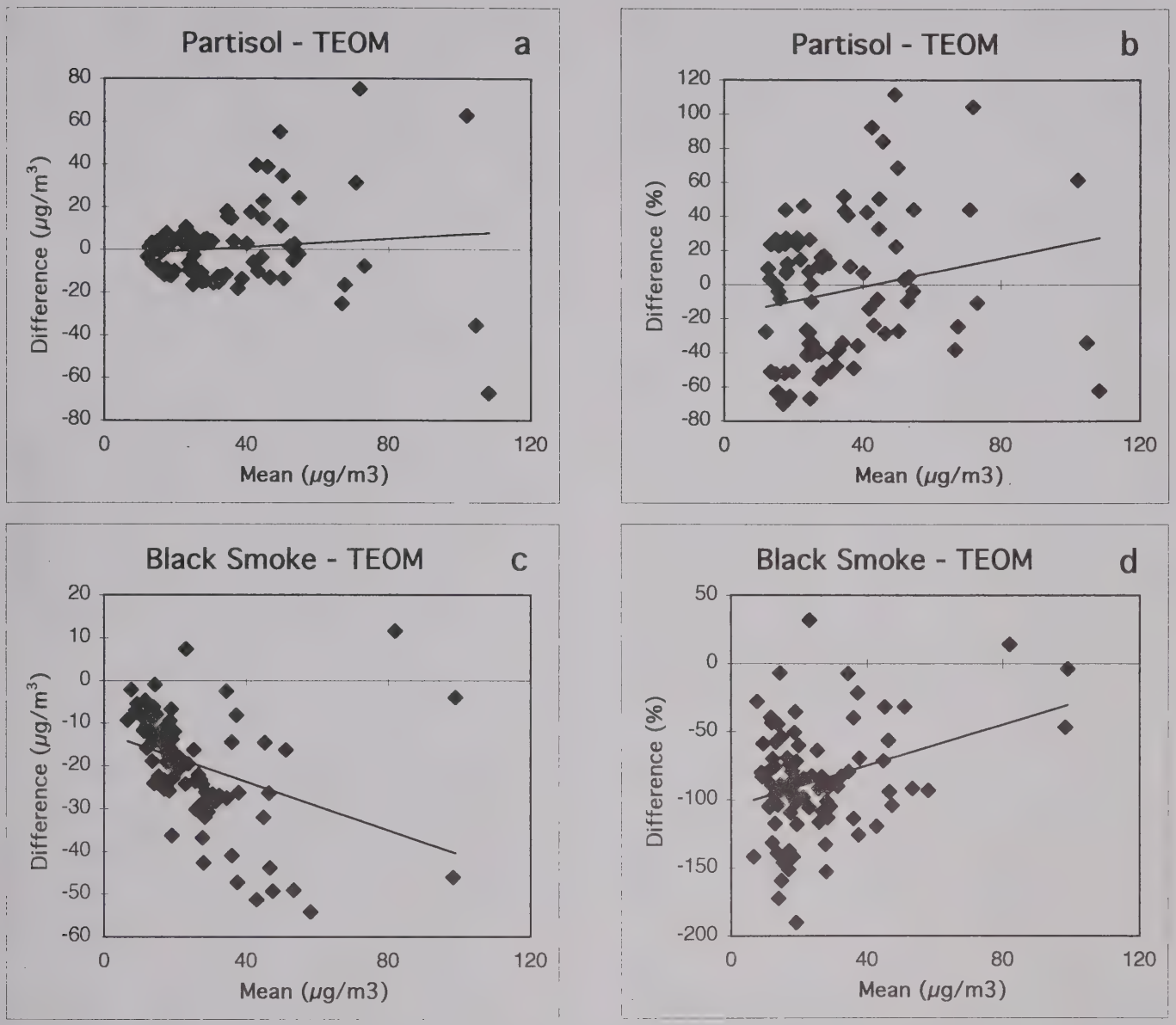

Figure 3 a-d Absolute and Relative Differences Between Samplers Plotted Against Mean Concentration. Also shown are best fit regression lines.

Cambridgeshire

Introduction

The Cambridgeshire First Phase Group was set four tasks by the DETR:

1. To test and (hopefully) further develop the draft guidance issued to First Phase Authorities.
2. To model and assess levels of carbon monoxide, oxides of nitrogen, nitrogen dioxide, particulates (PM_{10}) and benzene at the kerbside of the City Council's Regent Street automatic monitoring station, and also at the roadside of Anglia Polytechnic University's automatic monitoring station. Models to be used are ADMS Urban, DMRB, CAR, CALINE4, CAL3QHC, and both the short and full versions of AEOLIUS.
3. To assess levels of nitrogen dioxide, black smoke and PM_{10} using non-automatic methods at the existing automatic urban monitoring site.
4. To develop a simple screening tool for first stage review and assessment of congested narrow canyon streets carrying traffic flows as low as 8000 vpd.

Results

1. Test the Draft Guidance

From our street canyon automatic monitoring station data we were unable to confirm the pollutant relationships postulated in draft guidance. We concluded that the relationships postulated needed refining to take account of modal split and vehicle speed. We were also not content

with the way in which the draft guidance treated the timing of maximum ground level concentrations arising from line sources and elevated sources. Cambridge City has a plethora of narrow canyon streets where nitrogen dioxide measurements by diffusion tubes show annual mean concentrations in excess of 40 ppb, where 50% of 24 hour running means of PM_{10} are in excess of 50 $\mu g/m^3$ but with traffic flows as low as 8000 vpd. Clearly the draft guidance was wanting in its treatment of these situations at the initial screening phase of air quality review and assessment.

2. Model and Assess Levels of Specified Pollutants

The model intercomparison work at the canyon street site and open ring road site has proved very useful in enabling the selection of the appropriate model for the appropriate application and site type. Our conclusions from this work are that AEOLIUS and ADMS Urban would probably make useful additions to the local authority air quality review and assessment toolkit. However there are limitations in the area of particulate modelling in relation to background concentrations. In addition, the use of the more complex dispersion models requires a level of knowledge and skills that will inevitably mean a steep learning curve for many local authorities, as well as enhanced computer hardware requirements.

All the modelling work was carried out using DMRB emission factors and we concluded that these may not be fully representative in some cases. We believe that there is a need for a recommendation from DETR to adopt a common emission factors database in order to provide a uniform approach nationally for the year 2005 predictions.

The correlation between measured nitrogen dioxide and calculated values using the Derwent-Middleton relationship shows that concentrations are under-estimated at high NOx concentrations. The atmospheric chemistry module for ADMS Urban was not available for evaluation during the study period. Accessing and manipulating meteorological data for model inputs is far from straightforward, particularly in view of the closure of many of the Met Office measuring sites.

3. Assess Levels of Specified Pollutants using Non-automatic Methods

The results of the non-automatic monitoring for nitrogen dioxide and particulates was fairly inconclusive and a longer period of monitoring may have been beneficial. Additionally, the continuous automatic monitoring station against which the manual data was to be referenced failed to get affiliated to the national network, as scheduled, resulting in some suspect automatic monitoring data.

The results do however confirm some relationships and trends. Two week deployment diffusion tubes tend to give marginally higher results for nitrogen dioxide than four week deployments. Mean values from diffusion tubes are only marginally higher than those obtained for nitrogen dioxide by chemiluminescence. Particulate results by Partisol give higher results than the continuous beta attenuation instrument. There is poor correlation between black smoke, beta attenuation and Partisol measurements of PM_{10}. At the kerbside monitoring station in a canyon street, where a very large proportion of pollutants are motor vehicle derived, there is a strong correlation between NOx results and black smoke. Benzene and carbon monoxide objectives are predicted to be met with ease in 2005.

4. Develop a Screening Tool for Review and Assessment of Congested Narrow Canyon Streets with Flows as Low as 8000 vpd

The canyon street look up table was derived using DMRB emission factors and the OSPM model; it calculates, for given street dimensions, a quantity of pollutant that will give rise to a breach of the NAQS objective for that pollutant. This quantity is then converted to a peak hour traffic flow and peak hour vehicle speed at a fixed modal split. The table thus enables canyon streets to be screened on the basis of dimensions and estimates of traffic flow and speed. A limited amount of testing of the tables has been carried out.

Further Information

The report has been submitted to DETR as a draft. Once it has been agreed and finalised the Council will make it available at a reasonable charge. It would be helpful to receive views on the format that would be acceptable to most in order to save reproduction costs. The options available include:

a) for the modelling report and lookup table: hardcopy; Email (WordPerfect 6.1) or 3.5 floppy.

b) for the monitoring results: zipped up files in Excel v5, Email or 3.5 floppy.

Please contact Adrian Beeching at City of Cambridge City Council, The Guildhall, Cambridge CB2 3QJ. Tel: 01223 463374. Email: a.beeching@cambridge.gov.uk

Cornwall

Introduction

When in 1995 the Government announced its proposals for a National Air Quality Strategy, including plans to set up a group of "first phase authorities", Cornwall was well placed to submit a bid to become one of the rural based areas.

A bid was prepared very quickly, based on the established Cornwall Acoustics Group, which links the six local authorities in Cornwall, the County Council and Cornwall College on acoustic issues.

Confirmation was received in June 1996 that the Cornwall Air Quality Forum (CAQF) had been selected as

a "first phase" area and a total of £89,500 in grant aid was received from the Department of Environment (DOE) to complete two tasks:

1. To carry out a detailed assessment of proposed guidance on assessing air quality, based on comprehensive guidance contained within a working document *Guidance on Reviewing and Assessing Air Quality for First Phase Areas.*
2. To test a range of fine particulate (PM_{10}) monitoring equipment and, in so doing, to assess the impact of quarrying activity in the St. Austell china clay area. (From the outset, it was clear that hard scientific information on particulates was scarce.)

1. An Assessment of Air Quality in Cornwall

Testing what proved to be reasonably workable guidance issued by the DOE, the CAQF followed a stage by stage procedure to assess air quality in each of the participating authority's area with reference to nitrogen dioxide, sulphur dioxide, ozone, carbon monoxide, benzene, 1,3-butadiene and lead. In most cases little or no information on levels of these pollutants exists in Cornwall and values had to be assumed from estimates made by the National Environmental Technology Centre (NETCEN).

Information gathered in this way suggests that by and large air quality in Cornwall is generally good; however, there are obvious dangers in assuming that these extrapolated values are true for a region in which large numbers of slow moving motor vehicles are present in narrow thoroughfares in many villages and towns during the summer months.

Following this step by step procedure all processes authorised for either integrated pollution control or local air pollution control under Part I of the *Environmental Protection Act 1990* were assessed in terms of their likely impact on local air quality; again, although the contributions of these processes to air pollution in Cornwall appear on paper to be within NAQS objectives, there is such a paucity of specific monitoring information that long term assessment is difficult.

The final piece of relevant information to be assessed as part of the step by step process was based on traffic flow levels within the county. Information provided by the County Highways Department's traffic volume monitoring stations indicates that there are no current sites where traffic volumes exceed the assessment criteria (roads with more than 25,000 vehicles per day : roads with over 50,000 vehicles per day); there is, however, concern that as traffic volumes grow - particularly in and around the City of Truro which is in a valley - the situation will undoubtedly become worse. There is clearly cause for concern in Cornwall which has abnormally high traffic volumes, often moving at slow speed, during the summer holiday months.

By strictly following the guidance process, it was clear that Cornwall could declare that air quality standards are likely to be achieved without any further work. However, in view of the many questions raised in an area where air quality had never before been a major consideration, it is also clear that we cannot "close the book". It has been recognised that if Cornwall is to maintain high standards of air quality then a Management Strategy, particularly in relation to planning and traffic is essential. The partnerships developed during the early work of the CAQF will provide a sound basis for any such work.

Ozone

Levels of tropospheric ozone (low level ozone) in the South West, principally derived from continental air masses, are amongst the highest in the UK. Damage to commercial crops, natural vegetation and to pollution-sensitive ecosystems by low level ozone is currently outside the scope of the National Air Quality Strategy; however, this is a problem of some significance in a rural area like Cornwall.

2. Assessment of Fine Particulate Matter

The CAQF's second task was to assess equipment available to measure levels of PM_{10} (particulate matter below 10 microns in diameter).

In particular, CAQF was instructed to purchase, set up (no simple task in itself) and test two types of particulate monitoring equipment. These would be sited within the St. Austell china clay area to provide new information on the likely contribution of mineral extraction operations to local air quality. Through the considerable efforts of the research department at Cornwall College and with the full cooperation and support of the Headteacher, a monitoring site on the roof of St. Dennis School was set up to simultaneously monitor levels of PM_{10}. Testing was based on a TEOM unit with a Partisol instrument at the same site. Two other Partisols were set up as controls at different sites within the China Clay district. The opportunity was also taken to run a Casella instrument simultaneously at St. Dennis, but availability limited this work. A Mini-Vol unit was also purchased independently by Cornwall College and run in parallel with both TEOM and Partisols. The Mini-Vol is a relatively low cost self-contained and mobile unit which gave encouraging results. The technical difficulties in establishing and running such equipment at a remote site should not be underestimated. Monitoring has now been taking place over a period of seven months and has measured levels of PM_{10} consistently within NAQS standards (< 50 ppm). However, the (ongoing) study did demonstrate a number of areas for further research. For example, there were

- significant short term exceedances - linked possibly to local coal fires and on one occasion to sustained inversion conditions;

- particles responsible for causing visible nuisances in the china clay area were too large to be measured by the equipment used, i.e. they were larger than 10 microns in diameter. This might be interpreted as excluding the possibility of this material being hazardous to health.
- the nature of the particles themselves (sea salt, hydrocarbons from motor vehicle emissions, particles from coal fires, dust from agricultural activities and very fine [PM_2 - PM_5] mica particles) requires considerable further investigation, particularly in identification.

Results have also shown that the TEOM unit consistently records lower levels of pollution than measured on the Partisol; this may be due possibly to the burning off of volatile particulates which must be an area of concern where TEOMs are used to monitor traffic pollution.

More Questions than Answers

At the beginning of our work on assessing air quality we were tempted to go out and buy a wide range of monitoring equipment. We now realise that would have been a serious error, not least because of our subsequent experience with PM_{10} monitoring apparatus, which has been difficult and demanding.

We were warned by our scientific advisers at Cornwall College to beware the appliance of science, and to anticipate our work raising more questions on local air quality than providing straightforward answers. That warning has proved accurate time and time again as our work has progressed and leads to the conclusion that any local authority undertaking a review of air quality must either be satisfied in using readily available air quality modelling data, or should be prepared to invest in high quality scientific support.

Further Information

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Hampshire and Isle of Wight

Introduction

Hampshire and the Isle of Wight is made up of 14 local authorities which cover a range of highly developed urban conurbations, as well as a number of rural areas. The area has a very busy road network together with a wide range of industrial processes.

The Hampshire and Isle of Wight First Phase Area was set two specific tasks by the Department of the Environment, Transport and the Regions (DETR):

1. To assess the value of using a number of different methods of constructing an emission inventory for volatile organic compounds from Part B processes.
2. To assess the levels of benzene around Fawley Oil Refinery using non-automatic monitoring techniques; and to model the dispersion of benzene around the Refinery comparing the performance of a range of dispersion models specified by the DETR.

Portsmouth City Council acted as the coordinating authority for the work involved.

1. Assessing the Value of Different Methods of Constructing an Emission Inventory for VOCs

The different methods used to construct an emission inventory for VOCs from Part B processes within Hampshire and the Isle of Wight produced quite different results; none came close to the predicted results from the National Inventory - see Table:

Method	*Total VOCs (tonnes)*	*% of Enhanced II*	*% of Inventory Estimate*
Standard*	184.99	7.5	2.6
Enhanced I**	2,091.23	84.8	29.2
Enhanced II***	2,467.39	100	34.5
Nat. Inventory	7,143	-	-

* Local authorities acquiring details on emissions of VOCs from Part B processes using only the information available on the public registers.

** Individual local authorities contacting operators and obtaining information from RSK Radian.

*** Portsmouth City Council using assumptions/calculations for missing relevant information (based on data from RSK Radian). This could therefore be regarded as the most accurate of the results obtained from the exercise.

The results of the exercise suggested that the construction of a local emission inventory could produce widely varying results depending on the method employed. It was apparent that the information currently held on the public registers is insufficient to undertake such an exercise and that if emission inventories are to be used as a tool in the review and assessment process there is justification for modifying the information which must be obtained when process operators apply for an authorisation. The study demonstrated that although a local emission inventory could be useful if identifying the major sources of pollutants within a local authority's district, the construction of such an inventory is a very time consuming process, which ultimately may only be of limited use to local authorities in undertaking the review and assessment process. For the results to be used to assess local air quality, it is likely that some form of modelling would be required which could lead to significant expenditure for a local authority.

2. To Assess Levels of, and to Model the Dispersion of, Benzene Around Fawley Oil Refinery

This second task was in two parts. The first aspect was to assess the levels of benzene around Fawley Oil Refinery using non-automatic monitoring techniques; the second aspect was to model the dispersion of benzene around the Refinery comparing the performance of a range of dispersion models specified by the DETR. The models chosen for this study were ISC3LT and ADMS-2. It had been hoped to include the INDIC model but this was not possible due to the cost involved. The models were to be used to set up adverse scenarios to predict worst case situations, to predict levels in 2005 and to compare modelled levels with results obtained from the monitoring exercise in the area.

The results of the benzene monitoring survey suggested that there was no evidence that the Fawley Oil Refinery was contributing significantly to the level of VOCs in the area surrounding the site. However, the results did call into question the reliability of the BTX diffusion tube monitoring technique.

The modelling exercise was contracted to an external company due to the specialist nature of the work. The results of this exercise suggested that for modelling long-term average concentrations for the area in question the ISC3LT had a number of advantages over ADMS-2. Neither of the models were however considered ideal for the project where there was a need to consider both industrial and traffic sources of benzene. It is understood that models are currently available which are more suited to such a scenario but these are considerably more expensive. It was apparent from the study that many local authorities may not currently have the technical expertise to undertake such modelling. It was also clear that the choice of the model used and the quality of data inputted into the model are both crucial in determining the validity of the modelled results.

3. Review and Assessment

In addition to the specific tasks set, the Hampshire/Isle of Wight First Phase Area was required to undertake a review and assessment of air quality in its area in order to evaluate the guidance provided by the DETR (*Guidance on Reviewing and Assessing Air Quality for First Phase Areas - Working Draft No. 1*, June 1996). At the time of undertaking this evaluation the guidance only contained information on four of the eight pollutants covered by the National Air Quality Strategy - carbon monoxide, benzene, 1,3 butadiene and lead. The results from this initial, limited study suggested that it was unlikely that any of the local authorities in Hampshire and the Isle of Wight would be required to declare an Air Quality Management Area as levels of these pollutants would not exceed the specified air quality standards in 2005; however, it is likely that quite different results could be obtained when the authorities are required to look at ambient levels of PM_{10} and nitrogen dioxide.

The study revealed a number of problems with the guidance and in particular with the *Design Manual for Road and Bridges* (DMRB), which was the model used to predict air quality from traffic data. These included problems in obtaining the traffic data necessary for inputting into the model and the limitations of the model itself, which does not take into account the effect of meteorology and topography of the area; nor does it cover all the pollutants for which air quality standards have been set. It was found that there is very little information available on emissions from Part A and Part B Processes and that the only way in which ground level concentrations of pollutants from such processes could be estimated in many instances would be by the use of modelling which could lead to significant expense for local authorities.

General Conclusions

The work of the Hampshire/Isle of Wight First Phase Authority clearly demonstrated that it is possible for a regional grouping of local authorities to work together in the development of the review and assessment process. In order to facilitate this it was necessary to form an Air Quality Steering Group of local authority officers and experts from the Environment Agency, the Met Office and from local universities. In addition, an Air Quality Forum was developed to involve industry and the public in the work. It was clear however that there is a variation in experience, expertise and commitment between local authorities taking part in the study; clear guidance and technical back-up will be necessary from the DETR and NETCEN when all local authorities come "on-line" in the review and assessment process.

Further Information

Further information on the work of the Hampshire/Isle of Wight First Phase Area can be obtained from Lee O'Neil or Paul Hunt at the Environmental Health and Trading Standards Department, Portsmouth City Council, Civic Offices, Guildhall Square, Portsmouth PO1 2AZ, Tel: 01705 834167.

High Peak & Derbyshire Dales

Introduction

There are more than sixty mineral processes within High Peak and Derbyshire Dales, including four Part A processes involving lime and/or cement production. The area is largely rural but is ringed by conurbations - Greater Manchester, West Yorkshire, South Yorkshire, the East Midlands and the Potteries. When the opportunity arose in 1996 to bid for funding to carry out monitoring, a joint proposal was put forward by High Peak Borough Council and Derbyshire Dales District Council to monitor PM_{10} in the area. The proposal was accepted and the DETR gave us the following aims:

1. Quantify and characterise the effects of activities at quarries on levels of PM_{10} at nearby locations.
2. Compare the levels of PM_{10} as measured by TEOM, light scattering and gravimetric techniques.

Completing the Tasks

Four monitoring sites were established, three within 400m of the boundaries of large limestone quarries in the Buxton area, together with a background site over 5 km from the nearest mineral process. A Casella APM 950 PM_{10} monitor (a light scattering instrument) was installed at each site. A TEOM 1400A was co-located with one of the Casellas at the Tunstead site (adjacent to a large Part A process). A wind speed and direction monitor was also set up at Tunstead. The Casella APM 950 was chosen for two main reasons. Firstly, it is a continuously recording monitor with automatic data processing and logging which would allow running averages to be calculated. Secondly, the sampled PM_{10} is collected on a filter, and can be weighed. This gravimetric facility allows for checks to be made on the continuous monitoring, and most importantly, chemical analysis of the collected PM_{10} can be carried out. Locating a TEOM and an APM 950 at the same site allows a comparison to be made between the two instruments.

Monitoring began in December 1996 and the study was completed in September 1996. PM_{10} concentrations were logged every 10 minutes, producing a large amount of raw data over the study period.

The following weekly graphs were produced for each site:

- graph showing the 10 minute running average and the 24 hour running average;
- graph comparing the four APM 950s;
- graph comparing one of our sites with results from the DETR's Automatic Urban Network (AUN) sites at Manchester and Sheffield;
- graph comparing the TEOM and the APM 950 at Tunstead.

In addition quarterly graphs were produced for each site, and graphs showing concentrations of calcium, sulphur etc. Exceedances of the air quality standard could be easily identified from the graphs. We could also see when peak concentrations coincided at two or more monitors. High concentrations were also assessed in relation to wind speed and direction.

Because the weekly filter papers could be analysed using scanning electron microscopy, we were able to calculate concentrations for a variety of elements (calcium, sodium, magnesium, aluminium, silicon, sulphur and potassium). This enabled us to make an assessment of the likely source of the PM_{10}. Data from the Manchester and Sheffield AUN sites enabled us to decide whether high PM_{10} concentrations were local or were found over a wider area.

Conclusions

- During winter, when exceedances of the air quality standard occurred at one or more sites, PM_{10} concentrations were also high at the remaining sites. Exceedances in the study area were mirrored by exceedances, or high concentrations, at the Manchester and/or Sheffield AUN sites. Exceedances often occurred also at other AUN sites in the region. The exceedances were associated with cold, still conditions, with the likelihood of temperature inversions.
- In the winter, sulphur was more significant than calcium as a source of PM_{10}. In addition to local emissions of sulphur, emissions from large-scale sources outside the study area may be involved.
- The exceedances of the standard during the summer appeared to be of a different character than those during the winter. Calcium was more dominant, indicating local quarry sources, and/or lime and cement processes. Exceedances were almost all due to calm overnight wind conditions. At night, quarry crushing and screening processes do not operate, but lime and cement processes do. When wind speeds increased during the morning, PM_{10} concentrations were reduced significantly, even when the monitors were directly downwind of the relevant quarry. When exceedances of the standard occurred in the study area, an increase in PM_{10} concentrations often occurred at the Manchester and/or Sheffield AUN sites, indicating similar poor dispersion of local PM_{10} due to calm weather conditions.

Further Information

Ian Nicholls, High Peak Borough Council, Environmental Health and Leisure Department, Town Hall, Buxton, Derbyshire SK17 6EL. Tel: 01298 28461.

London

Introduction

In common with all fourteen First Phase Areas London was set a number of specific tasks in relation to air quality management:

1. To assess levels of air pollutants at the kerbside or roadside of a congested street in London using roadside models and automatic and non-automatic measurements. (Including the specific investigation of the relationship between pollutants monitored at the roadside/kerbside station, and comparison of the measurement of pollutants using different methodologies.)
2. To install three meteorological monitoring stations in London.

3. To compare a number of local scale dispersion models.
4. To assess air quality over Greater London using two models at the "regional" scale, and compare the modelled results with one another, as well as monitored data.

The London Chief Environmental Health Officers Association agreed to the appointment of SEIPH as consultant for the work. The project was overseen by a Contract Management Group, with the London Borough of Haringey as fundholders for the project. Tasks 1, 2 and 3 were led by SEIPH, with task 4 being led by the Environmental Health Department of the London Borough of Croydon.

In addition to these specific tasks, each First Phase Area was asked to test the applicability of the Guidance, both in their own specific case, and overall. For London, it was decided to test specific aspects of the Guidance, to determine both what information was available for review and assessment, and how easy it was to obtain. This work, divided into three stages, looked at current and future sources of air pollution, air pollutant concentrations and issues which would need consideration in London. This work formed a separate report to those prepared for the specific tasks.

1. Kerbside Monitoring

A kerbside monitoring site was installed on the Marylebone Road; this is affiliated to the AUN for the inorganic pollutant measurements, and also includes an automated gas chromatograph, as well as filter based particulate matter samplers and black smoke, an 8 port smoke and sulphur dioxide monitor, nitrogen dioxide and benzene diffusion tubes, PAH filter based sampling and a lead sampler.

Analysis of the data has shown that this site is highly polluted, and one of the sites that most frequently exceeds DETR standards due to the heavily trafficked road and the street canyon.

The range of particulate analysis has allowed many correlations. The preliminary findings indicate that:

- comparing the PM_{10} gravimetric analysis to the TEOM measurements has shown that the TEOM underestimates the gravimetric analysis by approximately 9%;
- the two TEOMs have shown that 65% of the PM_{10} is made up of $PM_{2.5}$;
- a brief comparison of the different kerbside monitoring sites has shown that there is a great deal of site specificity when undertaking black smoke monitoring, therefore making it difficult to relate PM_{10} results to these data.

The nitrogen dioxide passive diffusion tube results so far have indicated that this form of analysis can underestimate the results from the continuous nitrogen oxide analysers.

2. Meteorological Monitoring

To monitor the meteorological parameters three way sonic anemometers were installed. These are capable of providing advanced measurements for use in dispersion modelling (such as heat flux), thus allowing comparisons to be made between these direct measurements and calculations made by meteorological pre-processors, which are now incorporated with up to date dispersion models.

One sonic anemometer has been installed at the Marylebone Road site on the roof of the cabin, a second is in place on the roof of a block of flats on Portland Street in Southwark (a Meteorological Office approved site). It was planned to install the third at high level on the Crystal Palace mast, but costs proved prohibitive, and agreement is currently being sought with the London Borough of Bromley to place the third instrument on the roof of the town hall (also a Meteorological Office approved site).

The instruments in place have so far indicated that windspeeds in the Marylebone Road street canyon are on average ten times lower than those recorded by the Meteorological Office at the London Weather Centre. The anemometers have also proved successful in measuring parameters such as heat flux.

3. Small Scale Model Intercomparison

A number of small scale (roadside) dispersion models were compared, both against each other and against monitored data from the roadside site in the London Borough of Tower Hamlets. The models used in the comparison were:

DMRB
AEOLIUS
CAR International
CALINE4
ADMS Urban

The study showed that the models were more able to predict long term averages than short term air quality objectives (such as hourly maxima or percentiles). The models are also not able to fully account for all small scale meteorological effects at the roadside (such as recirculation). Over the short time period studied, the ADMS and CAR International models proved to be the most effective.

4. Regional Scale Model Intercomparison

This task was designed to benchmark test two commercially available regional scale dispersion models, ADMS Urban and Indic Airviro. The models were used on two areas of London, a 1 by 1 km square in central London, and one a 7 by 10 km rectangle in east London, covering

the Thames Gateway area. The task involved using the models to predict concentrations of nitrogen dioxide and sulphur dioxide over a twelve month period, with these results being compared with measured data for the same period. Full datasets of meteorological information were also fed into the modelling programmes for the 12 month period.

The gathering of sufficient robust data for the modelling exercise proved to be extensively labour intensive and, given the tight deadline for project completion, it was not possible to obtain good quality data on the urban background sources for the study area. This highlighted the need for an accurate, comprehensive and up to date emissions inventory for any study area for which regional scale modelling is being considered.

Nevertheless, both models were fairly successful in providing reasonably accurate predictions of nitrogen dioxide and sulphur dioxide for the reference time periods, although in some cases, the predictions were out of phase with real time in terms of forecasting episodes of high concentrations.

Further Information

Tasks 1, 2 & 3: Andrew Deacon, Environmental Research Group, South East Institute of Public Health, David Salomon's Estate, Broomhill Road,Tunbridge Wells, Kent TN3 0XT. Tel: 01892 515153.

Task 4: Brian Irving, London Borough of Croydon, Taberner House, Park Lane, Croydon CR9 3BT. Tel: 0181 760 5437.

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Merseyside

Introduction

The offer of assisting the then Department of Environment in 1996 on developing and testing guidance on Air Quality as a precursor to legislative changes was regarded as a challenge by the Merseyside Councils of Liverpool, Sefton, Wirral, St Helens and Knowsley. At the time it seemed like a good idea - however once we were given the tasks and extra finances it was apparent that this venture was not going to be an 'easy ride'. We had to do some real work!

Strategically we felt that it was not possible or practicable to operate in isolation and quickly formed a Steering Group made up of members with differing skills in modelling equipment, monitoring, finance, programming and organisation born out of the already existing Merseyside Air Pollution Group. This involved a substantial change in operational methods and we found that barriers such as 'who holds the money' needed to be addressed fairly quickly if we were to achieve the goals set.

Through discussion Knowsley Officers held the budget, paid the bills and looked after the project generally and in accord with the other four boroughs undertook the routine work.

All members felt that interpersonal as well as organisational skills were extremely necessary to overcome the problems with structures and bureaucratic organisations. It must also be said that members of the team have come out of the tunnel better able to deal with problem situations and by finding solutions to problems before they arise.

In August 1996 the Merseyside local authorities were given three specific tasks to carry out, in addition to the general requirement to test the working draft *Guidance on Reviewing and Assessing Air Quality for First Phase Areas - Working Draft No 1 June 1996:*

1. To establish and operate automatic continuous sulphur dioxide (SO_2) and PM_{10} monitors at the existing Automated Urban Network (AUN) hydrocarbons site at Speke.
2. To model the dispersion of the SO_2, PM_{10} and hydrocarbons emissions from all significant sources around the Mersey Estuary.
3. To assess a methodology for compiling an inventory of volatile organic compound (VOC) emissions from selected Part A and Part B processes in the region.

In order to carry out the tasks the Merseyside Air Quality Management Group was set up and consisted of officers of the five Merseyside authorities with Knowsley in the co-ordinating role.

Results

The final report was submitted to the DETR on 31 October 1997 (the deadline set by the Department). Because the work was conducted on behalf of the DETR and funded by them the report remains its property and cannot yet be made public. To date no comment or response has been received from DETR. However, general conclusions drawn from the specific tasks can be summarised.

1. Establish and Operate Automatic Continuous SO_2 and PM_{10} Monitors at Existing AUN Site

Establishing the monitoring capability at Speke caused a number of practical and contractual problems which were overcome. The station was operated and provided data for inputting into the modelling exercise under Task 2. A link was established to a computer in Liverpool's office to enable the monitoring station to be interrogated remotely. The project was very useful in identifying difficulties other local authorities may experience in setting up such a station and details of these and suggestions for how they could be overcome were reported to the DETR.

By carrying out comparisons between two methods of monitoring PM_{10} the group was able to recommend the most practical method appropriate to local authorities when they come to do their statutory assessments.

Levels measured at Speke for both SO_2 and PM_{10} show exceedance of the Air Quality Standards. This issue is discussed further in Task 2. (It must be noted that the Air Quality Strategy recognises that the AQ standards may well be exceeded now because it introduces measures aimed at achieving the standards by 2005).

2. Model the Dispersion of Specified Pollutants from Significant Sources

The Group contracted out the task of modelling emissions for the selected significant source and are certain that this is the way forward for other local authorities carrying out assessments. It is known that other groups who attempted to use the dispersion models themselves experienced great difficulty. The models are complex computer programmes capable of predicting where pollution from a variety of sources will have its greatest impact.

Three different methods of modelling were applied with the aim of predicting pollutant concentrations at the monitoring station at Speke so that predicted levels could be compared directly with measured levels. Part of the upgrading of the monitoring station included the installation of meteorological equipment so that weather data would be put into the model's equations linking pollution to wind direction etc. Part of the specific task was to carry out a comparative appraisal of the three models used. One of the models, the most sophisticated, showed a very close correlation between predicted levels and measured levels.

Pollutant levels from the selected sources were predicted for the year 2005 to give an understanding of likely impacts of the pollutants at the statutory deadline for meeting the air quality standards. In making these predictions account was taken of any planned changes to the processes concerned and the impact of legislation. All three models predict considerable reductions, in particular for SO_2.

3. Assess a Methodology for Compiling an Inventory of VOC Emissions

This was a relatively minor part of the overall project and a small number of sources were considered to test the methods of compiling emissions inventories. From the study and from feedback from the modelling contractor, who also gathered inventory information to input into the models, the group has been able to recommend a number of actions to improve the way inventory data is gathered.

To obtain accurate data on emissions particularly those which are fugitive, i.e. not from a chimney, a change in the reporting requirements for Part A and B processes may be necessary. This issue is under consideration as part of the consultation process for implementation of the EU Directive on Integrated Pollution Prevention and Control.

Conclusions

- The Air Quality Phase 1 project has given officers in Merseyside a feel for what is needed under the new legislative regime. It has promoted cross boundary working, serving issues on a macro instead of a micro scale and allowed links with different and helpful agencies to be forged;
- the tasks set have been complex and comments made to the DETR. Some have been unfavourable but all have been borne out of a need to 'get to the bottom of things', produce factual information and critical assessments to help and assist other councils who are just embarking on the journey.
- the time allocated by officers initially was way below the actual time taken to complete the tasks;
- in setting up a monitoring system it is very important to check and double check and agree all the parameters required.

So far as Merseyside is concerned, the AQM team have forged a good working relationship and are eager to carry the expertise gained forward into 'making things happen'. The development plan is one of cross council operation, and development of a public awareness facility interlinked computer data system with monitoring stations. We are already in contact with other like minded authorities and are actually working with colleagues across the north of England on a pollution forecasting project in conjunction with the NSCA.

On a more local basis we are developing links with industry, education and commerce and pursuing grant aid to develop a resource and information centre.

There will shortly be a multi disciplinary team of transport, planning and environmental officers to deliver the legislative requirements and attempt to broaden horizons.

Further Information

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Ribble Valley

Introduction

Ribble Valley BC is located in the centre of the United Kingdom covering an area of 58478 hectares with a population of approximately 53000. It is predominantly a rural area, over 70% of which is designated as an area of outstanding natural beauty. The borough is bounded to the south and west by the industrial areas of Burnley, Blackburn and Preston with heavy industrial quarrying operations (limestone), cement manufacturing (using SLF Cemfuel) and chemical processing (catalyst) on the boundary of the central main town of Clitheroe (population 13700). Sixteen registered part B processes are scattered throughout the borough which comprises 49 parishes of which all but two are free to burn housecoal.

Ribble Valley BC was given three main aims by the DETR:

- to monitor levels of SO_2 , NO_2, and PM_{10} downwind of the large industrial source, by means of an automatic monitoring station;
- to compare the levels of NO_2 and PM_{10} as measured by the automatic station and by simpler surrogate techniques;
- to compare measured pollutant levels with those predicted using a range of models.

Ribble Valley BC's specific tasks were:

1. To establish a fixed automatic monitoring station.
2. To model the dispersion of pollutants from the cement manufacture, the mineral operations and the adjacent works.

1. Establish a Fixed Automatic Monitoring Station

This had to be at a site to be agreed by the QA/QC team selected by the DETR which would be free from obstruction and unlikely to be subjected to emissions from unwanted sources. The following parameters had to be monitored at the site:

a) PM_{10} - continuously using a TEOM, and non-continuously using a high or low volume sampler (LVS) fitted with an approved PM_{10} sampling head. The sampling strategy for the LVS was that the unit had to be electronically controlled to ensure 24 hour (midnight to midnight) sampling period on alternate days and the filters had to be prepared, conditioned and weighed by an accredited laboratory.

b) NOx - continuously using ozone chemiluminescence.

c) NO_2 - non-continuously using diffusion tubes, the analysis of which was undertaken by a laboratory who was accredited for participation in the national survey.

d) SO_2 - continuously using UV fluorescence.

The instruments used for continuous monitoring were required to have been type tested by the Department of the Environment's National Urban Quality Control Unit and the collected data was subjected to quality control and assurance to national standards. In addition the station was equipped to monitor for the following meteorological data:

- wind speed
- wind direction
- air temperature
- atmospheric pressure
- relative humidity
- solar radiation.

1.1 Practicalities of Setting-up the Monitoring Station

As no one within the authority had experience in this field it was decided to dedicate the work to the principal EHO who sought advice on what a specification for the provision of the station should include from a colleague at Lancashire County Council Public Analyst who had recently taken delivery of a similar unit and to whom I am extremely indebted (a hard copy of the specification is available from the author).

The specification met the needs of the task apart from the air-conditioning unit which was not able to maintain the station at the required temperature in the winter period, due to not having a heat source; an additional thermostatically controlled heating unit has, therefore, had to be provided. *(It is considered that the original specification should have covered this point fully; to avoid similar discrepancies, it is recommended that a specification for the supply of similar equipment needs to cover this area adequately).*

Several sites were selected but only two were accepted as suitable by the QA/QC team. The following were some of the reasons for refusal:

- the site being overshadowed by trees;
- the site obstructed by adjacent buildings;
- pollution sources which could interfere with the data collection.

The sites selected were in adjacent open land free from obstructions and down wind of the source to be monitored which would give meaningful results for the modelling and meet QA/QC criteria. Negotiations with one of the land owners for permission to site the station was difficult and broke down at an early stage basically on rent costs. The alternative site was on a playing field which could have been prone to vandalism. In an attempt to overcome such fears it was decided to erect a 2 metre high fence for

additional protection and a 300 mm gap was provided at the base to allow retrieval of any footballs etc. The land owner required a formal contract which excludes them from any liabilities and was compiled by the Council's legal department. A full planning application was required which was granted with conditions which related to choice of materials and colour.

One of the problems of siting the station away from buildings etc meant that the nearest main services were some 200 metres away. A new metered connection to the mains electricity was necessary and the supply cable had to be laid in the ground to comply with the land owner's conditions. The estimated cost of connection to a land line communication network was £4500 and considered too expensive for a temporary site and alternatives were sought. It was understood from previous experiences that the area had some difficulties with the mobile network but following negotiations with the station supplier it was said that a mobile system would effectively provide the service at a considerable saving even though the individual calls would be more expensive. This did not prove to be the case and the following problems have led to exorbitant bills:

- the communication system was set to collect the measured pollutants automatically off-peak;
- unfortunately the communication network was not good and intermittent signal strength meant that data downloading was unsatisfactory;
- unknown to ourselves the mobile telephone was set on call divert;
- the effect of poor communication and the call divert setting meant that the computer at base would automatically make contact with the monitoring station only to be diverted without relaying the data at a cost of 25p every minute for the mobile and approximately 10p for the outward call.
- neither the mobile phone company nor the supplier of the station were able to explain the reason for such a set-up and were unable to offer alternatives.

By chance, contact was made with a local radio ham who had first hand experience with poor communication in the area and immediately indicated that we would always have problems with our set-up. He was able to offer a remedy for a cost of £60 which included the manufacture of a new aerial (yargi array) and fitting. The new aerial is a directional unit rather than its omni-directional predecessor and has improved communications immensely. Most qualified radio engineers would be able to design such an aerial; it is highly recommended that anyone considering the use of a mobile communication system should seek advice prior to purchase.

1.2 Comparison of Results of Nitrogen Dioxide (NO_2) as Measured by Automatic Analyser and Diffusion Tubes

1.2.1 Method

Three separate diffusion tubes were used each month in the survey and were mounted in parallel to the continuous analyser inlet and 450 mm away on the roof of the monitoring station. The first set of tubes were placed in position on 1 April 1997 and disappeared in the middle of the monitoring period by unknown means. Subsequent tubes escaped the phantom tube thief.

The results of the diffusion tubes were calculated by Lancashire County Council Analyst (accredited laboratory) and are reproduced in Table 1. The standard deviation is shown and the 98% tle for each tube has been calculated by using the 2.4 multiplication factor.

It is clear from the data that the absorption tubes provide reliable results. Table 2 shows the monthly mean results which have been calculated from ratified data obtained from the NO_2 continuous monitoring analyser. The October figure has been taken direct from the analyser's software.

Whilst the results of the diffusion tubes, individually, compare favourably with the analyser, the mean figure demonstrated in the box below provides evidence that the diffusion tubes, when used in parallel, offer reasonably accurate data when measured over a monthly period.

Month	*Analyser Monthly Mean*	*Diffusion Tube Monthly Mean*	*Difference*
May	7.18	7.00	-0.18
June	6.83	5.33	-1.50
July	7.84	8.66	0.82
August	9.52	7.00	-2.52
September	8.57	8.00	-0.57
October	*7.02	9.67	2.65

*Raw Data

1.2.2 Conclusions

It can be seen from the Tables and graphs that wind, humidity and NO_2 levels did not vary dramatically over the monitoring period so conclusions can only be made on the data available. Given the data as collected, the results clearly indicate that diffusion tubes used individually or in duplication are capable of providing realistic levels of NO_2 in the atmosphere.

1.3 Comparison of Results of PM_{10} as Measured by Partisol Low Volume Sampler and a TEOM Continuous Analyser

1.3.1 Method

Both samplers were fitted with PM_{10} heads of the same design and were mounted adjacent to one another on top of the monitoring station. The filters for the Partisol were conditioned and weighed by the Lancashire County

Council Public Analyst. The data from the TEOM were collected direct by NETCEN and ratified by them.

The Partisol filters were originally renewed on alternate days, but due to difficulties in arranging officer time over weekend periods the cycle was changed to every other working day. This proved more efficient but was not as convenient in operational terms as the continuous monitor, and more man hours were required for the task. Another disadvantage with the Partisol monitor is that it only provides a daily value. In order to compare the results of the monitors a daily mean of the quarter hour averages has been calculated for the TEOM.

1.3.2 Breakdown of the Results of 74 Samples

- On 6 days equal results were obtained;
- On 16 days TEOM levels exceeded the Partisol levels by 5 or less than 5 $\mu g/m^3$;
- On 29 days TEOM levels were less than the Partisol levels by 5 or less than 5 $\mu g/m^3$;
- On 13 days TEOM levels were less than the Partisol levels by 10 but more than 5 $\mu g/m^3$;
- On 9 days TEOM levels were less than the Partisol levels by 15 but more than 10 $\mu g/m^3$;
- On 0 days TEOM levels were less than Partisol levels by 20 but more than 15 $\mu g/m^3$;
- On 1 day TEOM levels were less than Partisol levels by 25 but more than 20 $\mu g/m^3$.

The actual weight of dust collected during the monitoring period was not significant when comparing the data.

Monthly charts were produced to compare the daily levels of PM_{10}; these show that there is little correlation between the results.

1.3.3 Conclusions

- Negligible correlation between the monitored data could be found. Out of the 74 samples 70% of the TEOM results were less and 21% were more than the Partisol results. Only 8% of the results correlated;
- as the results did not correlate it was not possible from this exercise to determine which monitor produced the correct data and raises some doubt as to what instrument should be used to monitor for PM_{10}. This is more significant where local authorities have areas which they consider may be bordering the exceedance levels;
- it can be seen from the ratified data produced by NETCEN, that there were 9 EPAQS exceedances during the monitoring period; however, the outcome of this exercise must surely put doubt on this figure, even though the TEOM levels which were used to calculate the data were generally less than the Partisol levels.

2. Modelling the Dispersion of Pollutants from the Cement Manufacture, the Mineral Operations and the Adjacent Works

The models to be used are:

- UK-ADMS
- ISC ST and LT
- R91.

The models will be used to estimate concentrations of pollutants from various sources based on measured emission data from the above works and information on background emissions due to domestic fuel use, quarrying activity and other small industrial sources. The results will be compared with the concentrations measured at the fixed site and with current and proposed air quality standards. Where possible, pollutant concentration levels will be predicted for the year 2005.

Results from this task are not yet available and it is planned to publish them later this year in *Clean Air*.

Further Information

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Table 1: Results of NO_2 Diffusion Tube Samplers (ppb)

Month	*Hours Exposed*	*Tube Numbers 1*		*Tube Numbers 2*		*Tube Numbers 3*		*Standard*
		Total NO_2	*98%tle*	*Total NO_2*	*98%tle*	*Total NO_2*	*98%tle*	*Deviation*
May	740.00	7.00	16.80	4.00	9.60	10.00	24.00	2.45
June	699.00	8.00	19.20	< 4	<9.6	<4	<9.6	1.89
July	741.00	7.00	16.80	10.00	21.60	9.00	21.60	1.25
August	744.00	8.00	19.20	6.00	16.80	7.00	16.80	0.80
September	720.00	11.00	26.40	8.00	12.00	5.00	12.00	2.45
October	720.00	10.00	24.00	12.00	16.80	7.00	16.80	2.06

Table 2: Results of NO_2 Continuous Analyser (ppb)

Month	*Hours Exposed*	*Mean for the Month*	*98 % tle*	*Capture Rate %*	*Mean Wind Speed M/S*	*Mean Relative Humidity - %*
May	740.00	7.18	17.23	99.06	1.98	78.94
June	699.00	6.83	16.39	97.28	1.74	82.09
July	741.00	7.84	18.82	90.82	1.67	80.33
August	744.00	9.52	22.85	85.22	1.47	84.54
September	720.00	8.57	20.57	86.30	1.90	85.14
October	720.00	7.02*	16.85	96.37	1.40	84.97

*Raw Data

South Wales

Introduction

The first phase experience for the authorities of Neath Port Talbot and Swansea began in February 1996 with the announcement by the then Secretary of State for the Environment, John Gummer, of the first phase authorities chosen to take forward the first stage in the development of local air quality management as part of the Government's plans for early implementation of Part IV of the *Environment Act 1995*.

The tasks, allocated in August 1996, were:

1. Monitoring the levels of fine particulate matter (PM_{10}), sulphur dioxide, nitrogen dioxide and carbon monoxide in the vicinity of a large integrated steel works, together with comparison of low cost measurement systems, e.g. black smoke method and bubbler with continuous measurement systems.
2. Establishing a fixed site to monitor levels of hydrocarbons, notably benzene and 1,3-butadiene in the vicinity of a petrochemical works using an automatic gas chromatography system utilising a non-cryogenic cooling system.
3. Carrying out a survey of benzene by means of diffusion tubes throughout the industrial area between Port Talbot and Swansea, which includes an integrated steel works and two petrochemical plants.
4. Modelling studies for benzene, sulphur dioxide, nitrogen dioxide and PM_{10} and comparison with measured concentrations.

In order to complete Task 1, the Neath Port Talbot monitoring station (recently co-opted onto the Automatic Urban Network - AUN), and a mobile monitoring station (Prince Street site) brought in by our Swansea colleagues were used. The two stations were at distances of approximately half a mile and one quarter of a mile in a straight line from the blast furnace/sinter plant area of the steel works. Results have been analysed for validated data for the AUN station for the period January to June 1997, and for the mobile station (Prince Street) for the period January to 10 April 1997.

1. Measurements of Inorganic Air Pollutants around Steel Works

The Expert Panel on Air Quality Standards (EPAQS) recommendation for PM_{10} was regularly breached at both sites:

- AUN - 225 exceedances on 23 days;
- Prince Street - 381 exceedances on 29 days.

Exceedances, concentrations and maximum levels increase closer to the steel works.

When pollution (PM_{10}) levels were plotted as a function of wind direction, the resulting pollution rose (see Figure 1) indicated that PM_{10} levels were highest from West South West of the AUN site; this is exactly the direction of the blast furnace sinter plant areas and the iron ore stocking area, and was confirmed by overlaying the pollution rose on a map of the works and the immediate area. Although it cannot be said with absolute certainty that the dust from the steel works is producing the majority of the exceedances, in this case it is felt likely; fingerprinting studies have commenced to try to characterise the varying source contributions to the PM_{10} fraction of the airborne dust.

For sulphur dioxide only a small number (four) of exceedances of the EPAQS recommendation were identified, all at the most distant monitoring station. Again after the pollution data were plotted as a function of wind direction, the resulting pollution rose indicated that sulphur dioxide levels were highest when the wind was blowing from the South Western Quadrant.

No exceedances of the EPAQS recommendation for nitrogen dioxide or carbon monoxide were observed. Carbon monoxide was, however, only monitored at the Prince Street site.

At the AUN site the black smoke method for the assessment of particle concentrations and a sulphur dioxide bubbler were compared with continuous measurement methods. Scatter graphs were plotted in both cases of concentrations of particles as measured by the TEOM as PM_{10} against black smoke concentrations, and sulphur dioxide as measured by the continuous analyser against those derived from the bubbler (Figures 2 & 3). The results indicated that black smoke concentrations at the site were approximately 24% of PM_{10} levels; sulphur dioxide concentrations as derived from the bubbler were 38% of those of the continuous analyser.

2. Establishment of a Fixed Site for Hydrocarbon Monitoring

3. Use of Diffusion Tubes to Monitor Benzene Levels

Following the establishment of the Perkin Elmer Analyser at a school site close to one of the petrochemical plants in the area, 4917 hourly measurements were made of benzene and 1,3-butadiene between November 1996 and July 1997. At the same site, three diffusion tubes were co-located at the site in order to compare concentrations of benzene obtained by the different methods. Over the same period diffusion tubes were exposed on a two week cycle at 51 sites. In total a database of 1611 results were obtained.

Figure 4 shows the average benzene levels obtained from the diffusion tube survey, sorted by concentration. Eight of the sites had levels where the EPAQS recommendation of 5 ppb annual running mean was likely to be exceeded; seven of these were, however, kerbside sites close to heavily trafficked roads, the exception being one site in an uninhabited area at a distance of 1900m from coke ovens. The two petrochemical plants were shown not to be having any noticeable effect on benzene levels in the urban areas surrounding them; the general conclusion reached was that vehicles were identified as the biggest contributor to airborne benzene concentrations in the study area.

Multiple tubes on site also generally provided consistent results.

With reference to the Perkin Elmer Analyser, the average concentration of benzene for the period was 0.73 ppb, with the highest monthly average being 1.2 ppb. A comparison of the diffusion tube results co-located at the Perkin Elmer site with the analyser indicated that the diffusion tubes were over-estimating the concentration of benzene by a factor of approximately 3.5, the diffusion tube average being approximately 2 ppb; this is shown graphically in Figure 5.

4. Modelling Studies

At an early stage in the study, a decision was taken to contract out the modelling aspects of the study to CERC Cambridge; their report was expected in early January 1998.

Further Information

Peter Hollingsworth, Principal Officer Environment, and Martin Hooper, Pollution Control Officer, both at Neath Port Talbot County Borough Council, Unit 1, Addison Road, Port Talbot SA12 6HZ. Tel: 01639 897548.

Acknowledgements

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Any views expressed or implied in this paper are those of the authors and do not necessarily reflect those of our employing authority or those of the co-operating authority.

Figure 1: Average PM_{10} Level vs Wind Direction, March - June 1997

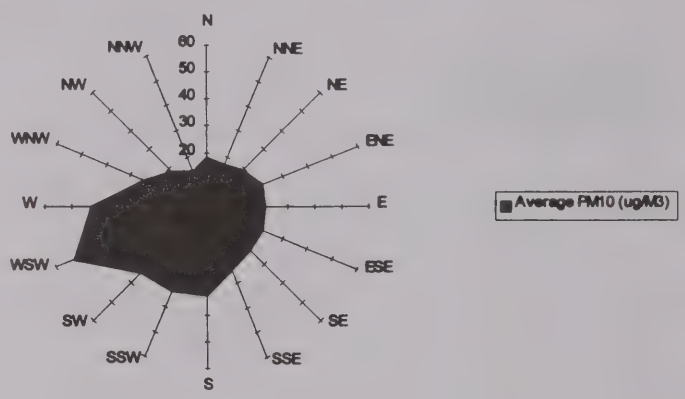


Figure 2: Comparison of TEOM and Black Smoke Methods

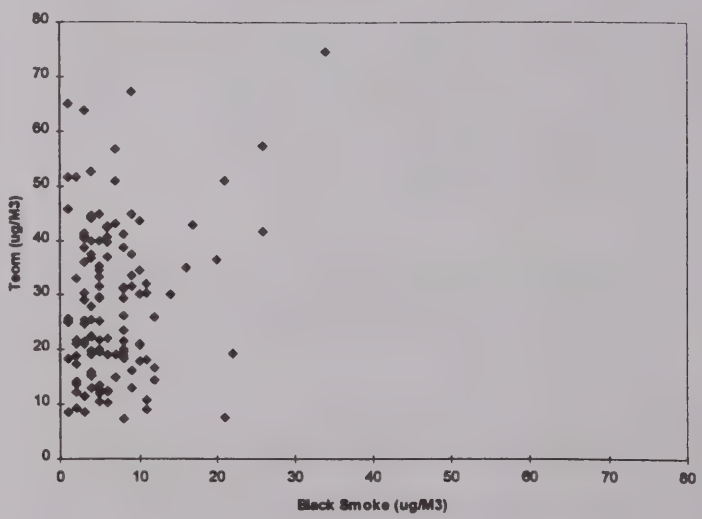


Figure 3: Comparison of Continuous and Daily Bubbler for SO_2 Analysis

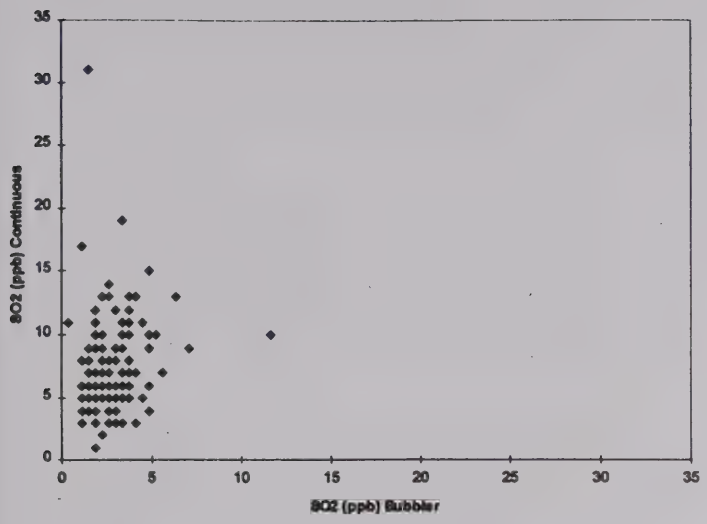


Figure 4: Sites Sorted by Average Benzene Level

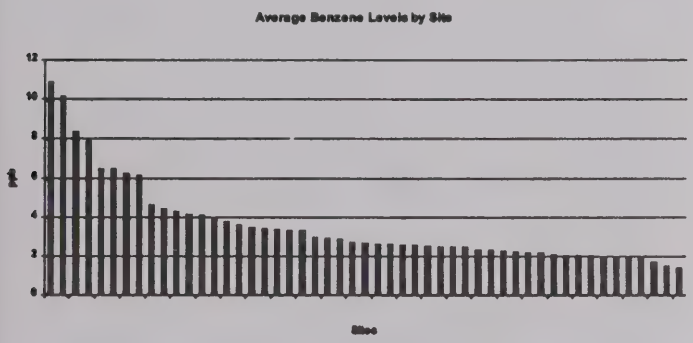
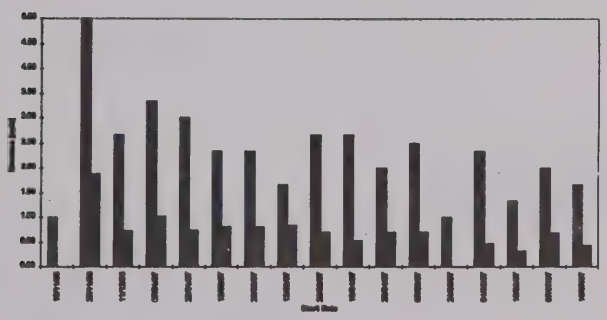


Figure 5: Comparison of Results from Perkin Elmer and Diffusion Tubes; Average Benzene levels (ppb). (Left bar in each cluster = tube; right bar = PE)



South Yorkshire

Introduction

The bid to contribute to the first phase authorities initiative came from a joint proposal involving Barnsley, Doncaster and Rotherham. The study was based on the Dearne Valley, an area which straddles the boundaries of all three authorities and has a history of elevated smoke and sulphur dioxide levels. The population is centred on coalfield communities with strong local loyalties to the community and the deep mining industry. The area is totally smoke controlled but there is still a significant level of solid fuel use.

There were four elements to the project:

1. To monitor levels of PM_{10}, particulates and sulphur dioxide at three locations and to compare different monitoring techniques both co-located and site to site.
2. To carry out a survey to determine fuel use in terms of types, quantities and reasons for choosing a particular fuel.
3. To determine emission rates of both particulates and sulphur dioxide for a range of representative solid fuels on an open fire and a closed room heater.
4. To model the effects of current and predicted fuel usage on the levels of particulates and sulphur dioxide.

1. Comparative Monitoring

The three sites were all central to typical townships in the Dearne and were fitted with different monitors to maximise the comparisons available. There were three aims:

a) same site comparisons of different techniques;
b) intersite comparisons of the same techniques;
c) looking for evidence of diurnal variations of sulphur dioxide and particulate levels.

a) Same Site Comparisons

- *8-port bubbler v UV fluorescence:* the 8-port consistently over-estimated levels; there was a positive offset to the 8-port; correlation was good except at one site where the data suggest that the levels were too low for the resolution of the 8-port technique.
- *Partisol v TEOM:* showed good correlation with the TEOM consistently giving levels below that of the Partisol.
- *Partisol v smoke stain:* good correlation with the Partisol consistently recording higher levels than the smoke stain although the degree varied site to site.
- *TEOM v smoke stain:* this comparison was inconclusive. One site showed good correlation with the TEOM recording higher levels than the smoke stain. The other site demonstrated poor correlation with a high level of scatter. This is still under investigation and no reason has yet been established for the discrepancy.

b) Inter Site Comparisons

- The UV fluorescence, Partisol and TEOM each showed good correlation between the different sites.
- The 8-port bubblers showed weak correlation whilst the smoke stains showed almost no correlation.

c) Diurnal Variations

Plots of the TEOM and real time SO_2 showed a discernible pattern of diurnal variation with morning and evening peaks being clearly evident.

2. Fuel Use Survey

A social survey was commissioned to:

a) estimate current levels of use of the different fuel types in the area;

b) predict future use of the different fuels and any barriers to change to more environmentally friendly fuels.

c) identify reasons for choosing the current solid fuel in use.

The key findings were:

- of the 24% of households using solid fuel 13% use unauthorised fuels. Sixteen per cent of households questioned claimed not to know the fuel used. It is therefore reasonable to assume that the figures quoted are an underestimation of the true situation;
- solid fuel was principally used by social classes D and E with coal usage being restricted to class E. The reason for use was quoted as its perceived low cost;
- 100% of petroleum coke users were aware of the smoke control orders in the area (compared to a population average of 80%) and saw petroleum coke as a smokeless fuel suitable for use in a smoke control area (despite it not being an authorised fuel in the form encountered);
- 43% of the population saw air pollution as a problem in the area, 33% did not, the main source of pollution being road traffic. Burning solid fuel was seen as being a source of pollution but by a ratio of two to one it was not felt to be of any significance;
- in terms of future use of fuel over the next five years only 1% of the population stated they might change fuel type. This was solid fuel and electricity users considering the change to gas.

3. Emission Factors

The appliances to be tested were an improved open fire and a room heater chosen as being representative of the types most commonly found in use today. PM_{10} emissions were determined by direct measurement, whilst SO_2 levels were calculated from the sulphur content of the fuel under test allowing for 5% of the sulphur being retained in the ash. Nine fuels were tested, six on the open fire and five on the room heater. The findings are summarised below:

- the vast majority of particulate emission is PM_{10} or smaller;
- bituminous coal gave off five to six times the level PM_{10} emitted by authorised smokeless fuels on an open fire and four times that of petroleum coke;
- petroleum coke when burnt on a room heater produced half as much again of PM_{10} as on an open fire and nearly three times that of authorised smokeless fuel;
- petroleum coke produced twice the SO_2 of any of the fuels tested and four times that of the lowest emitting fuel.

4. Modelling

ADMS Urban was used taking into account the above data and allowances for six power stations close enough to have an impact, air temperature as it affects the use of domestic heating meteorological data, and the artificial heat release from energy consumption.

Comparing the present day measured and modelled results for SO_2 there was a high degree of agreement. When the PM_{10} was considered, however, the model showed a high level of underestimation - higher than could be explained by model error. There are a number of possibilities for this but the most likely is that the PM_{10} from domestic sources is not the major source in the area and that other sources such as traffic need to be considered.

In view of the above only the SO_2 was modelled for the year 2005. This demonstrated that on the basis of the collected data there would be no exceedances of the Air Quality Strategy limit value.

Further Information

Further information can be obtained by contacting Peter Hubbard or Caroline Petty at Barnsley Metropolitan Borough Council, 27/29 Western Street, Barnsley S70 2BT. Tel: 01226 772458.

Acknowledgement

Particular thanks must go to Belfast City Council who were working on a similar project. Their help and cooperation was highly valued and of great assistance.

Tyne & Wear

Introduction

The Tyne and Wear Air Quality Management Group were allocated four tasks:

1. Assessment of benzene in the vicinity of petrol retail and distribution sites, using passive diffusion tubes.
2. Assessment and characterisation of PM_{10} concentrations adjacent to four industrial sources.
3. Assessment of lead concentrations in the area of two industrial sources.
4. Compilation of a VOC emissions inventory for Part A and Part B processes.

1. Assessment of Benzene

The task focused on four retail sites (of varying activity), a storage/distribution depot, and one control location away from obvious benzene sources. Five diffusion tubes were located around each site, with a 10% sample in triplicate for QC purposes. Exposure periods were fortnightly, over a total of six months.

Results show average benzene concentrations in the range 1.4 ppb to 1.9 ppb, but with some short term variations to a maximum of 6.3 ppb (adjacent to the storage depot) and 7.6 ppb (adjacent to the motorway service station). The control site exhibited an average of 0.96 ppb, some 68% lower.

Comparison of these results with previous monitoring exercises using OPSIS shows reasonable agreement, with OPSIS producing averages (dependent upon location) of between 1.1 ppb and 2.6 ppb. Results obtained also agree favourably with previous studies, such as those carried out by CONCAWE.

Although the Tyne and Wear results cannot be compared directly to the EPAQS recommendation, they do provide a degree of confidence that benzene levels in the area should not exceed the 5 ppb running annual average; however, compliance with the tighter target of 1 ppb may pose problems.

Comment

This task proved to be the simplest of the four, problems only occurring following the malfunctioning of laboratory equipment at the Analyst. Triplicate QC samples showed reasonable correlation.

Acquisition of tubes proved easy though the predictable problems with vandalism and theft (who wants a diffusion tube?) mean careful location of monitoring points.

2. Assessment and Characterisation of PM_{10} Concentrations

The Group selected five locations for the siting of Partisol air samplers:

- land reclamation site
- opencast coal site
- limestone quarry
- ship repair and steel fabricating using shotblasting and painting processes.

The plan involved the gravimetric analysis of exposed filter papers, with a proportion of all samples being subjected to specific investigation to characterise the particulates.

The acquisition of the equipment proved relatively easy compared to the selection of appropriate sites and the installation of external power supplies. Site owners did prove very helpful allowing access at all times and understanding the need for connection to their electrical system. The task proved very staff intensive with samplers requiring changing every alternate day, including weekends. The equipment did not pose any problems in operation over the six month project.

Initial speciation of samples by Energy Dispersive X-Ray analysis proved impossible due to the contaminants naturally present in the Pallflex TX40 filter papers. Unfortunately this did not come to light until near project completion, and resulted in two amendments to the programme. Pallflex filters were redirected to another laboratory for visual examination by Scanning Electron Microscopy, and "cleaner" cellulose acetate filters were utilised in an extension to the exercise.

Results

It is not possible to interpret the results to any degree here, but listed below are some of the points:

- There are significant variations in levels observed, obviously dependent upon site activity and weather conditions. Correlation against regional meteorological data failed in most cases, implying that such information does not necessarily accurately reflect local conditions. This is particularly so for the coastal sites;
- only the control site complied with the EPAQS recommendation of 50 $\mu g/m^3$. All other site locations exhibited exceedances of the recommendation, with the greatest number being related to the limestone quarry. There were a total of 51 exceedances in the six month monitoring period for all locations.
- the influence of sea salt should not be underestimated for coastal locations - the sea salt nucleus lies below the 10 µm diameter, and often contributed significantly to the particulate burden;
- the results indicate that whilst PM_{10} levels vary from site to site, there appears to be an almost regional correlation upon which specific sources impact to a lesser or greater degree.

3. Assessment of Lead Concentrations

The task proved difficult from the outset, having to be reassessed following the closure of a large waste oil burner and problems identifying a suitable small installation. The agreed revised task focused upon emissions from a Part B waste oil burner with heat output of less than 0.4 MW, and upon ambient lead levels due to the manufacture of lead oxides and calcium plumbate (a Part A process).

Whilst environmental monitoring took place using M-Type samplers, the task also involved stack and waste oil analysis (for the Part B process) and the running of a dispersion model for both lead sources.

The natural draft waste oil burner exhibited insignificant lead emissions. Whilst particulate concentrations were relatively high, the proportion of lead

was low. The majority of the lead content of the oil being retained in the combustion chamber - estimated at between 70 and 80% retention.

Ambient lead levels in the vicinity of the Part A process were low, presumably due to the high standards of abatement on site. Whilst the air quality model indicated higher concentrations than were actually measured (by a factor of three) it did prove useful in identifying the most appropriate monitoring locations, and indicated that ambient lead levels would not be influenced by site emissions beyond a 500 metre range.

Neither lead source resulted in an exceedance of the EPAQS recommendation.

Comment

As mentioned above, this task proved difficult from the outset. There were delays in acquiring equipment, in site selection and access. Stack analysis results for the waste oil burner could be viewed as indicative as the nature of the installation precludes sampling to the strict requirements of the British Standards.

The accuracy of the model is a major discussion point, and its selection took some time.

The costs of using a NAMAS accredited laboratory appear disproportionately high, and ironically there were problems in actually gaining final invoices so we could pay.

4. VOC Emissions Inventory

This final task proved frustrating, staff intensive and unproductive. There is a dramatic lack of comprehensive data in the format required to construct a suitable inventory.

Part B registers provided some initial data on total quantities of VOC usage, but were very rarely broken down by species (not a clear requirement of authorisation conditions). Many operators were simply unable to provide details directly, and were also unable to provide stack gas data. The largest VOC user estimated two man-weeks were necessary to provide the data required by the inventory spreadsheet.

The Environment Agency provided useful data direct from their database, though even this was not in the correct format and would need further work.

There are approximately 285 prescribed processes in the region and of these some 130 are significant VOC emitters. However, it should not be forgotten that there are certain non-prescribed processes which are of equal significance, for example elements of printed circuit board manufacture and mobile painting operations.

Further Information

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West Midlands

Introduction

The DETR invited the seven West Midlands Metropolitan Authorities to participate in a Pilot Study to examine certain aspects of the process for Review and Assessment of air quality, required under Part IV of the *Environment Act 1995*.

A joint working group was set up under the auspices of the Chief Officers in the West Midlands Local Authorities. The Group consisted of Environmental Health staff from Birmingham and Coventry City Councils; Dudley, Sandwell, Solihull, Walsall and Wolverhampton Metropolitan Borough Councils; and staff from the School of Geography, at Birmingham University.

The Group was given three tasks:

1. To establish the emissions of lead from Part B authorised processes.
2. To validate the West Midlands Emissions Inventory.
3. To compare two dispersion models: Indic Airviro and ADMS Urban.

1. Emissions of Lead from Part B Authorised Processes

The primary purpose of this task was to ascertain whether fugitive emissions from certain industrial processes made a significant contribution to the total emissions from those processes. Three processes were studied:

- a ferrous foundry
- a non-ferrous foundry
- a lead-crystal glass works.

Weekly measurements of airborne lead were made around each process, at one location upwind and two locations downwind of the premises, for three months.

The results of the lead-in-air surveys, shown in Table 1, indicated that a high proportion of the individual samples, from both the ferrous foundry and the lead-crystal glass works exceeded the proposed standard of 0.5 µg $Pb.m^{-3}$. Similarly, a number of the individual samples from the "fugitive" sampler on the survey of the non-ferrous foundry exceeded the proposed standard.

2. Validation of the West Midlands Emissions Inventory

The purpose of this exercise was to compare the estimates of emissions of pollutants, quoted in the LRC Emissions Inventory, to those calculated from a Box Model, whose outputs were adjusted for measured values.

Table 1: Summary of Median Values for Airborne Lead
(values quoted in $\mu g.m^{-3}$)

	Ambient Level Upwind	*Fugitive Levels*	*At Point of Estimated Max glc* *Directional*	*Background*
Ferrous Foundry	0.15	0.85	1.58	0.59
Percentage exceeding 0.5 $\mu g.m^{-3}$	10%	60%	90%	50%
Non-Ferrous Foundry	0.13	0.15	insufficient data	0.10
Percentage exceeding 0.5 $\mu g.m^{-3}$	0%	40%	not calculated	0%
Lead-Crystal Glass Works	0.90	2.68	0.43	0.50
Percentage exceeding 0.5 $\mu g.m^{-3}$	60%	90%	40%	50%

The sum of the total emissions, included in the West Midlands Emissions Inventory, were expressed as an emission rate per unit area ($tonnes.km^{-2}$), for each pollutant under consideration. These emission estimates were then compared to the "Box Model" estimates, and the results are presented in Table 2.

The West Midlands Emissions Inventory gave reasonably good agreement with the Box Model predictions for total oxides of nitrogen but less satisfactory agreement with the predictions for carbon monoxide and PM_{10} particles.

3. Comparison of Dispersion Models: Airviro and ADMS-urban

For the purposes of the Pilot Study, the West Midlands Group compared the predictions from the models with the levels of pollutants measured at the AUN stations in the region. The comparison was made in two ways; against long term measurements (seasonal scenarios) and short term time series measurements (specific hour modelling).

Thus, in the first case, the West Midland's Emissions Inventory was applied to summer and winter meteorological scenarios, using the Airviro model. Grid maps of the predicted concentrations of carbon monoxide, total oxides of nitrogen and PM_{10} dust were prepared. Printing constraints preclude the inclusion of the maps in this article, but they showed that:

- the predicted distribution of the levels of total oxides of nitrogen followed the shape of the built environment and demonstrated clearly the effects of the emissions in town and city centres and along major arterial roads. The 98th percentile values in summer were much lower than in winter; reinforcing the observation on the effects of warmer temperatures, increased atmospheric chemistry and greater vertical mixing, during summer pollution episodes. If one applied the Derwent/ Middleton relationship of NO_2:NOx to 98th percentile values, in winter, then the highest predicted values, 1000 $\mu g/m^3$, were equivalent to the NO_2 Limit Value of 200 $\mu g/m^3$ (105ppb).
- the 99th percentile values of carbon monoxide predicted that the highest values would occur near the major roads and that the highest values, of 8 to 10 ppm, corresponded to the highest values measured in the conurbation.
- the distribution of PM_{10} particles was unusual. Two major areas of high concentrations were indicated, South Birmingham and a predominantly rural area of North Warwickshire. When taken in conjunction with the results of the validation exercise, the model predictions indicate that the sources of airborne dust built into the Inventory need to be reassessed.

In the second approach, both models were run for each hour of three to four day examples of summer and winter pollution episodes. The results show that:

- both models generally follow the pattern of the measured concentrations and predict many of the peaks within the episodes.
- both models show inaccuracies but they generally predict values within a factor of two to three of the measured values.

Summary

The West Midlands work has demonstrated the benefits of neighbouring local authorities cooperating in the process of Review and Assessment.

Table 2: Comparison of Emission Estimates Generated from a Box Model and from the West Midlands Emissions Inventory
(values quoted in $tonnes.km^{-2}$)

	Total Oxides of Nitrogen	*Carbon Monoxide*	*PM_{10} Particles*
Estimated from the Box Model	63	530	27
Estimated from the West Midlands Inventory	52	170	5
Percentage by which Inventory under-estimates the Box Model Predictions	20%	70%	80%

Local authorities will obviously need to follow the guidance issued by DETR, but the key points to emphasise are:

- allow adequate time for the purchase and installation of monitoring equipment. The process invariably takes longer than expected;
- allow even more time to compile and upgrade an Emissions Inventory;
- purchase hourly meteorological data from a representative met station;
- use reference methods for automatic measurements and standard methods of sampling and analysis for non-automatic measurements, to ensure acceptability;
- emissions of lead from hot processes will need to be assessed carefully;
- dispersion models perform well and are a cost effective method of identifying the problem areas.

Further Information

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AIR QUALITY - GENERAL

Ambient Air Quality Standards: Current Developments

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In recent years there has been considerable development on air quality standards within individual European states and at an international level under the United Nations Economic Commission for Europe (UNECE), the World Health Organisation (WHO) and the European Community (EC). Standards may be set for a whole range of purposes (Farmer, 1997). They may be set for blanket protection, to protect some component of the environment or they may allow "acceptable" impacts for practical reasons. Standards may also be set in different formats. It is important, therefore, to compare developments at an international level with those in individual States in order to achieve a more coherent integration.

This paper will compare developments at the EC and UNECE level with those in the UK. The UK is a good example as, in March 1997, it published a detailed National Air Quality Strategy (DoE, 1997). This describes a number of standards and a management framework for their assessment and use. The Strategy stated that it would be subject to review in 1999. However, following the general election in the UK in May 1997, the new Government has indicated that the review is to be brought forward. Given the limits in the scope of the standards in the Strategy and recent EC developments (see below) an examination of the relationship between international and UK developments is, therefore, timely.

Sources and Scope of the Standards

This paper will examine four sets of "standards". These are:

1. *Standards for eight pollutants in the UK National Air Quality Strategy*. These are set for the protection of human health. Further developments that may protect the natural environment would be covered in the Strategy review. The standards variously comprise long-term and short-term concentrations and a compliance objective is set for 2005 (this need not be 100% compliance). Currently the standards are not statutory. Even when they have been set in legislation, there will be no absolute requirement for compliance. Rather, regulators and/or local authorities will be obliged to take measures to improve air quality where standards are not met, which may or may not bring about compliance.

2. *Existing EC standards*. Standards were set in three Directives in the early 1980s for suspended particulates and sulphur dioxide (80/779/EEC), nitrogen dioxide (85/203/EEC) and lead (82/884/EEC). The standards are aimed at protection of human health with both mandatory and guide values. These are the only legally enforceable air quality standards in the UK.

3. *New EC proposals*. The Directive on Ambient Air Quality Assessment and Management (96/62/EC) sets out a framework for the management of air quality which would include the requirement to meet standards which would be outlined in future Directives. In October 1997 the European Commission proposed the first series of such standards for four pollutants aiming for the protection of human health and the natural environment (where relevant), building on recent WHO developments (EC, 1997). It should result in the repeal of the existing Directives described above.

4. *UNECE critical levels*. The UNECE Convention on Long-Range Transboundary Air Pollution has produced a number of initiatives across Europe for the reduction in air pollution. One of these has been the identification of critical levels for the protection of vegetation (Ashmore & Wilson, 1994). These levels set thresholds for adverse impacts for four gaseous pollutants and have been promoted by the British nature conservation agencies as "unofficial" standards for ambient air quality (Farmer, 1995).

Comparison of Standards

The standards produced by the above four approaches are outlined in Table 1. It can be seen that no one approach at setting standards covers the same range of pollutants as the others. The most comprehensive is the UK National Air Quality Strategy which covers eight of the nine pollutants listed. It does not address ammonia, which is considered (at current ambient concentrations) only to represent a threat to the natural environment.

Some human health standards have been tightened. For

Table 1

A comparison of "standards" produced under the 1997 UK National Air Quality Strategy, existing EC Directives (using guide values where applicable), recent proposals for standards from the European Commission and critical levels developed under the UNECE. Where standards for the same pollutant are published in different formats (e.g. ppb or µg/m³), these figures have been converted in order to enable and more direct comparison.

Pollutant	UK National Air Quality Strategy	Existing EC standards or guide values	European Commission Proposal		Critical Level
			Human health	Natural environment	
Ammonia	None	None	None	None	3300 µg/m³ as 1 hour mean 270 µg/m³ as 1 day mean 23 µg/m³ as 1 month mean 8 µg/m³ as annual mean
Benzene	5 ppb as running annual mean	None	None	None	None
1,3-Butadiene	1 ppb as running annual mean	None	None	None	None
Carbon monoxide	10 ppm as running 8-hour mean	None	None	None	None
Lead	0.5 µg/m³ as annual mean	2 µg/m³ as annual mean	0.5 µg/m³ as annual mean	None	None
Nitrogen dioxide	287 µg/m³ as 1 hour mean 40 µg/m³ as annual mean	50 µg/m³ for 1 year as 50th %ile of 1 hour means; 135 µg/m³ as 98th %ile	200 µg/m³ as 1 1 hour mean and 40 µg/m³ as annual mean	30 µg/m³ as an annual mean (combining both NO and NO_2)	95 µg/m³ as 4 hour mean 30 µg/m³ as annual mean (combining both NO and NO_2)
Ozone	50 ppb as running 8-hour mean	None	None	None	Calculated as a dose above 40 ppb for daylight hours for a three month growing season: 5300 ppb hours (crops) 10,000 ppb hours (trees)
Particulates (PM_{10})	50 µg/m³ as running 24 hour mean	None	50 µg/m³ as 24 hour mean and 30 (20 in 2010) µg/m³ as annual mean	None	None
Particulates (PM_{25})	None	None	40 µg/m³ as 24 hour mean and 20 µg/m³ as annual mean. Note: indicative and non-complusory	None	None
Sulphur dioxide	266 µg/m³ as 15 minute mean	100-150 µg/m³ 24 hour mean 40-60 µg/m³ as annual mean	350 µg/m³ as a 1 hour mean. 125 µg/m³ as 24 hour mean	20 µg/m³ as annual and as winter mean	10, 15 or 20 µg/m³ as annual and as winter mean depending on vegetation type

example, the standard for lead in the existing EC Directive (82/884/EEC) is 2.0 $\mu g/m^3$ as an annual mean, whereas the proposed new EC standard is 0.5 $\mu g/m^3$ as an annual mean. The new proposed EC standard for nitrogen dioxide is also tighter, while that for sulphur dioxide is similar to the older guide value.

Some standards in the UK National Air Quality Strategy are comparable to those proposed by the European Commission. This is so for lead, nitrogen dioxide (annual mean) and PM_{10} (24 hour mean). However, the proposed European Commission standards are tighter than the UK Strategy for nitrogen dioxide (1 hour mean). The UK Strategy does not provide an annual mean standard for PM_{10} as proposed by the European Commission. It is also difficult to compare the UK sulphur dioxide standard (based on a 15 minute mean) with that proposed by the European Commission (based on a 1 hour or 24 hour mean). The European Commission proposal also includes indicative and non-compulsory targets for $PM_{2.5}$. This is a new development which is not reflected in the current UK Strategy, but might be suitable for consideration as the Strategy is reviewed.

Currently there are no proposals from the European Commission for a range of important air pollutants which are serious problems for human health, including benzene, 1.3-butadiene, carbon monoxide and ozone. However, the 1996 Air Framework Directive requires such standards to be proposed by future daughter Directives.

The proposed European Commission standards for the natural environment are based on the critical levels and this is to be welcomed. However, these are limited to the annual mean level for nitrogen dioxide and a general protective level for sulphur dioxide. Nevertheless, if adopted, these would represent the first statutory ambient air quality standards for the natural environment in the UK.

Discussion

Standards for ambient air quality are developing continually and, at no time, should any standard be regarded as definitive. A critical level, for example, is defined as "the concentration of pollutants in the atmosphere above which direct adverse effects on receptors, such as plants, ecosystems or materials, may occur according to present knowledge". The standards in the UK National Air Quality Strategy are required to "be based on the best available scientific understanding and experience". Clearly the scientific basis for standards is not static. For those standards based on threshold effects (e.g. critical levels), changes in the values might occur if more sensitive receptors are found. However, more likely are developments where no thresholds exist (e.g. for PM_{10} and human health), where judgements are made about acceptable impacts on populations.

Identification of standards is only the first step in achieving "good" air quality. It is important that clear management procedures exist to ensure compliance with the standards and that mechanisms are established to deal with instances of non-compliance. There has been considerable criticism, for example, of the UK National Air Quality Strategy in providing local authorities with insufficient regulatory powers to achieve the standards proposed. There also needs to be a clear identification of responsibility for implementing the standards and of what redress is possible. Thus, for local authorities with sufficient powers to manage traffic, it may be possible to blame a local authority for allowing breaches of standards caused by emissions from road vehicles, but not where standards are exceeded by transfer of pollutants from elsewhere (e.g. ozone).

The problem of responsibility may even prevent adoption of some standards. In the EC, if Member States are legally required to meet a standard, then it is unlikely that they will agree to standards for which they do not have local control. Otherwise the situation might arise where people living in Sussex, for example, could take the UK Government to court for failure to meet an EC ozone standard when the pollutant has been transported from France. It is important that such anomalies are overcome so that adequate standards are adopted across the EC and that an overall picture of air quality problems is developed even if individual Member State responsibility is difficult to identify.

Standards adopted by the European Commission will, of course, have a clear statutory basis. However, it is important that these are implemented with common sense. It will be important, for example, to achieve human health standards as soon as possible. These should be universally applied as it can, generally, be assumed that populations are equally sensitive in different locations. However, those for the natural environment need to take account of local circumstances. Thus in areas which historically received very high ambient air pollution levels (especially of sulphur dioxide) species' sensitivity to ambient air pollution may be less than in more pristine areas. Indeed, these latter areas would require the lower critical levels for sulphur dioxide identified in Table 1 rather than that proposed by the European Commission.

Wherever standards are adopted, it is important that detailed strategies for monitoring are established. The 1996 Air Framework Directive provides some guidance on this, but the detailed monitoring requirements need, not only to be pollutant specific, but receptor specific. For example, if the proposed European Commission standards for nitrogen dioxide are adopted it is necessary to monitor short-term and long-term concentrations for human health, but only long-term concentrations for the natural environment. To achieve this would necessitate expensive electronic monitoring in urban areas for human populations, but,

probably, only cheap diffusion tube monitoring in rural areas for the natural environment. In this case, UK monitoring would build on an extensive existing monitoring network.

It is important that any review of the UK National Air Quality Strategy takes account of developments in protection of ambient air quality in other areas. The UK will need to form a view of the European Commission proposals and modify the standards in the Strategy if necessary. It is also time that the Strategy took account of the protection of the natural environment. The failure to include standards for the natural environment in the 1997 Strategy was unfortunate, especially given the fact that the scientific basis for some of the values for critical levels is stronger than that for some of the standards for human health. The proposals from the European Commission will aid in this. However, the Government will need to consider whether to adopt standards for the natural environment for pollutants not proposed by the Commission. This could be both for pollutants already included in the Strategy (ozone) and those not currently included (ammonia). To take management action to improve ambient air quality while only focusing on one set of receptors (i.e. humans) may prevent optimal solutions for an overall improvement being chosen.

The adoption of standards for the natural environment should not pose too many problems in practice. Of the four gaseous pollutants for which critical levels have been set (Table 1), one is now in considerable decline - sulphur dioxide. Although the more stringent critical levels have not been adopted within the new European Commission proposals, in very few places in the UK is even the 10 $\mu g/m^3$ as an annual mean or winter mean exceeded and these are locations where ground level concentrations of sulphur dioxide were once very much higher (EA, 1996). Emissions of the pollutant have declined considerably (Salway *et al*, 1997) and are expected to continue to decline. Ground level concentrations of ammonia and nitrogen dioxide have, however, been rising (EA, 1996), although emissions of the latter have recently fallen (Salway *et al*, 1997). However, it is clear that further consideration may need to be given to implications of high rural concentrations of these pollutants in rural areas. Finally, the problem of high rural ozone levels remains a significant problem that requires international action. This pollutant is a problem throughout many rural areas, including those of the uplands where the usual diurnal fluctuations are less marked and high night-time concentrations are maintained (PORG, 1993).

The development of standards in the UK should play an important role in the setting of industrial emission limits by regulators. The Environment Agency's guidance on BPEO assessment (EA, 1997) outlines a clear relationship between environmental standards and emission limits, including a reference to critical levels for the natural environment. It would also be expected that standards developed by the EC would be expected to aid in the regulation of processes under IPPC.

There are likely to be significant developments in setting air quality standards over the next few years both within the UK and in the EC. It is important that, where good scientific evidence exists for standards, these are adopted for whatever receptor is appropriate. However, it is also clear that appropriate monitoring requirements are identified and adopted and that the necessary regulatory powers and responsibilities are provided in order to take action to meet these standards.

Acknowledgement

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Using the MOT Check to Determine Grossly Polluting Motor Vehicles

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This paper considers the relationships between vehicle exhaust emissions and the age and level of use of the motor vehicle. One year's MOT emissions test data have been collected and analysed from a garage in a small town. As expected a small proportion of gross polluters contribute a significant amount of carbon monoxide and hydrocarbon emissions. A relationship has been determined between carbon monoxide emissions and the degree of vehicle use for both exhaust catalyst and non-catalyst equipped vehicles.

Introduction

It is often assumed that a number of 'grossly' polluting vehicles contribute a disproportionate amount of exhaust emissions. Elsom (1996) states that one badly maintained car can produce as much air pollution as 40 cleaner cars. Muncaster (1994) determined the carbon monoxide and hydrocarbon emission contribution of the dirtiest 10% of London vehicles to be 57 and 66% of total emissions respectively. QUARG (1993) report studies that suggest approximately 80% of total carbon monoxide and hydrocarbon emissions are generated by the 20% most poorly maintained road vehicles.

To identify and rectify these polluting vehicles a check of exhaust emissions has been included in the annual roadworthiness (MOT) test for vehicles since 1991. The MOT test now contains a general check of the engine tuning to ensure that exhaust emissions comply with the UK construction and use regulations. The limits that are currently in use are:

- for vehicles registered on or after 1 August 1986, 3.5% carbon monoxide vol/vol, in the exhaust gas measured under idling conditions.
- for vehicles registered on or after 1 August 1973 and before 1 August 1986, 4.5% carbon monoxide vol/vol, in the exhaust gas measured under idling conditions.
- for vehicles registered on or after 1 August 1975, 1200 ppm hydrocarbons vol/vol, in the exhaust gas measured under idling conditions.

If a vehicle fails the emission check the engine may be retuned to improve the fuel consumption and hence reduce emissions. Reduction in carbon monoxide and hydrocarbon emissions of 10-15% have been predicted as a result of including emission tests in the MOT check (DoT, 1995).

Summary of MOT Emission Test Results

This study presents a summary of the emission test results over a one year period (May 1996 - May 1997) undertaken at a garage in south west England. Only petrol vehicles are included in the study. Over the year 287 MOT tests were undertaken. Thirteen vehicles were fitted with a three way catalytic converter. This small proportion of vehicles fitted with an exhaust catalyst is not surprising as new motor vehicles are exempt from the MOT test until they are three years old. The EC Directive stipulating the fitting of catalytic converters to new cars has only been effective in the UK from 1 January 1993 hence many new cars fitted with an exhaust catalyst were not yet due for a MOT check throughout the duration of this study.

During the test carbon monoxide and hydrocarbon concentrations in the exhaust gas are determined by infra red spectroscopy as part of a standardised program. The vehicle registration and mileage are also recorded by the operator. This enables a determination to be made of whether the vehicle's age (*i.e.* registration) and level of use (*i.e.* mileage) influence the concentration of pollutants released in the exhaust.

Due to the large number of data points and considerable scatter in the data the information was simplified by categorising it into classes, e.g. age or mileage intervals (*i.e.* 0 - 10000; 10001 - 20000 etc). For data such as this where there is considerable scatter the median is a better measure of central tendency than the mean and has been used here.

Results and Discussion

The following two observations were apparent from examining the data:

(1) The 20% most polluting vehicles generated 55% of the total hydrocarbon emissions.

(2) The 20% most polluting vehicles generated 49% of the total carbon monoxide emissions.

This is in line with the findings of Muncaster (1994) and generally supports the assumption that the relatively few poorly maintained vehicles, on the roads, generate a disproportionate amount of air pollution.

There was no clear relationship between vehicle age and carbon monoxide and hydrocarbon emission. There was some evidence of a relationship between carbon monoxide emission and vehicle mileage; this is shown in Figure 1. A similar relationship between hydrocarbon emission and vehicle mileage was not found. The general observation was that higher levels of carbon monoxide were emitted from vehicles with a high mileage. The calculated correlation coefficients and their levels of

significance are given below:

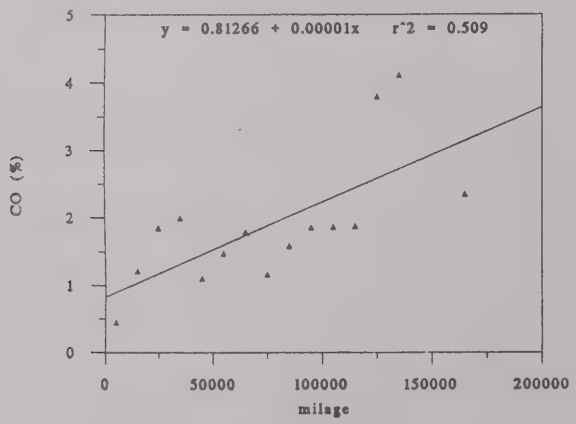
CO emissions with mileage $r^2 = 0.509$ $p < 0.05$

HC emissions with mileage $r^2 = 0.013$ N.S.

Although a very strong relationship between vehicle age or mileage and emissions may be expected this is not the case. Clearly some motorists keep their engines tuned but there is some evidence that cars which have been used more emit a larger proportion of carbon monoxide than less frequently used vehicles.

A large proportion of a vehicles total emissions are likely to occur during the first moments after the engine has been started from cold. During the MOT check the emission test will not occur until the engine has been running for a period sufficient to heat engine oil temperature to 60°C (or in practice until the temperature gauge reads 'warm'). This has the effect of standardising the emissions test to optimum engine conditions with emissions occurring during the critical warm up period being neglected. The European light duty test cycle (as described by Directive 91/441/EEC) also fails to record these emissions as, for technical reasons, emission collection does not begin until 40 seconds after the vehicle's engine has started. In the real world emissions are discharged into the environment from the moment the engine fires and there are moves to adopt emission tests which more accurately reflect real world driving conditions.

Figure 1: Carbon Monoxide Emissions from Petrol Motor Vehicles

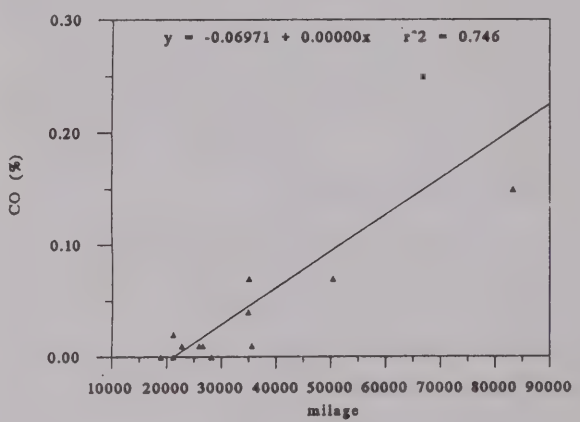


The Influence of Fitting an Exhaust Catalyst

The carbon monoxide emissions from the thirteen vehicles fitted with an exhaust catalyst are plotted alongside their mileage in Figure 2. As with the non-catalyst vehicles a relationship can be determined where the carbon monoxide emissions increase with increasing vehicle mileage. Here the relationship is statistically stronger ($r^2 = 0.747$, $p < 0.01$) and again no clear relationship for hydrocarbon emissions could be determined.

There is a serious disadvantage in using an exhaust catalyst rather than engine tuning to control pollution emissions in that if the pollution control device fails then levels of all exhaust pollutants will rise dramatically. The failure of the pollution control device does not affect the performance of the car and the driver may therefore be unaware of any problem until an emission test is performed. It is often not realised that the catalytic converter has an operational lifetime of 60-70 000 miles. It is therefore not surprising to observe greater carbon monoxide emissions in high mileage, catalyst equipped vehicles. The higher mileage catalyst equipped vehicles in this survey are still well below the acceptable carbon monoxide limit but a much larger number of vehicles would need to be surveyed to confirm this.

Figure 2: Carbon Monoxide Emissions from Vehicles Fitted with a Catalytic Converter



There is clearly a dramatic decrease in carbon monoxide emissions in cars fitted with an exhaust catalyst. The cars fitted with a catalyst in this survey were either 3 or 4 years old and a comparison can be made between these vehicles and the non-catalyst vehicles of the same age. The mean carbon monoxide emission from the non-catalyst vehicles was 2.92% whilst for those vehicles fitted with an exhaust catalyst it was 0.05%. Following a t-test on this data the non-catalyst vehicles carbon monoxide emissions were found to be significantly greater than those of the catalyst equipped vehicles ($p < 0.05$).

Fitting vehicles with a catalytic converter is a major step to improving urban air quality, however, there are limitations to any technological solution to air quality problems. It will be interesting to observe the performance of vehicles fitted with an exhaust catalyst in emissions tests over the coming years. In the meantime emission testing of vehicle exhausts is being extended to roadside testing. Successful schemes have already being employed in London and are to be extended to other urban centres in the UK. Targeting gross polluters remains a simple and cost effective measure in the management of urban air quality.

Acknowledgements

The author would like to thank the staff of ATS Minehead, and in particular Brian Giess, for their help with this work.

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NSCA NEWS & VIEWS

DEVELOPING AN INTEGRATED TRANSPORT POLICY

1. Introduction

NSCA welcomed the opportunity to contribute to the development of an integrated transport policy for the UK. Overall the Society believes that the Government must, however, take a more proactive approach to outlining the positive benefits which an environmentally sustainable integrated transport policy can deliver for the UK as a whole. The Government must provide a clear vision of the future. It must persuade people that its policy will actually make Britain a better place to live, raise children, work and to do business.

Unfortunately the DETR consultation paper, published last August, was rather disappointing in this respect: it lacked detailed recommendations, failed to convey a clear vision of what the Government is trying to achieve, or to address the issue with the urgency it deserved. The consultation paper also fails to place environmental considerations at the heart of the Government's policies. It says only that they will be given "more weight". While admitting that the forecast growth in road traffic is "clearly unacceptable", it fails to acknowledge that *existing* traffic levels are unacceptable in many locations. More fundamentally perhaps, the paper fails to recognise that our current transport system as a whole is unsustainable, and that transport costs do not reflect the true social and environmental costs (impacts) of transport.

Finally, the consultation paper fails to acknowledge that transportation noise is a significant environmental and quality of life issue and the importance of measures to promote walking and cycling, within an integrated transport policy. Walking should be recognised as an essential step in all journeys. The provision of cycle lanes and secure cycle storage facilities needs to be improved. Greater provision is also required for transporting bicycles on trains and buses.

The Labour Party election manifesto stated that "*A sustainable environment requires above all an effective and integrated transport policy at national, regional and local level that will provide genuine choice to meet people's transport needs.*" However, the Government must also recognise that an integrated transport policy will not deliver a sustainable environment unless environmental concerns are made central to the development of that policy.

The NSCA understands the need for a fundamental review of UK transport policy, in order to develop a genuinely sustainable integrated transport system. Creating such a sustainable system is likely to prove a long-term project. It may take a generation to achieve and require radical social and technological innovation. However, what is important at this juncture is that the Government takes effective action to begin to shift policy in the right direction.

The NSCA believes that there is already widespread support for a range of positive measures which could be implemented without further delay, in order to begin to reduce the environmental and social costs of transport. The Society therefore urges the Government to use the forthcoming Integrated Transport White Paper and Spring 1998 Budget to announce a series of detailed policy initiatives - 'no regrets' measures - aimed at moving the UK transport system in a more sustainable direction (see Section 2 below).

2. Transport and Air Quality

The NSCA wrote to the Environment Minister, Michael Meacher MP, on 16 October 1997 enclosing an interim policy statement concerning the current review of the UK National Air Quality Strategy. This policy statement outlined a package of measures aimed at closing the 'policy gap' in the National Air Quality Strategy by tackling emissions from road transport. The Society believes that this package of measures should form an important element of the forthcoming Transport White Paper.

Road transport is the UK's largest single source of both nitrogen dioxide and particles. Oxides of nitrogen from road transport also make a major contribution to the formation of ground level ozone. In many cases the measures proposed by the Society to cut emissions of these pollutants would also contribute greatly towards achieving the Government's target of a 20% reduction in carbon dioxide by 2010. The Society's recommendations are briefly summarised below:

a) *National vehicle emissions classification scheme*: as part of a wider programme to link vehicle excise duty to emissions and restrict access to sensitive areas.

b) *Powers to exclude dirty vehicles from environmental city zones*: where enhanced emission and noise limits would be specified for commercial and public service vehicles.

c) *Congestion charging and area licensing*: with proceeds to be reinvested locally to improve traffic management and public transport.

d) *Environmental performance criteria for buses, taxis and LA contractors*: local authorities to be provided

with explicit powers to specify enhanced environmental performance criteria for bus and taxi operators, and local authority contractors, such as refuse collection, street cleaning, etc.

e) *Green commuter plans*: local authorities to be provided with the power to require large firms to implement green commuter plans.

f) *Roadside vehicle emissions testing*: the Government should bring forward regulations to enable all local authorities to carry out roadside vehicle emissions tests as soon as possible and extend powers to stop vehicles to local authority officers, traffic wardens and special constables.

g) *National traffic reduction targets*: as proposed in the Road Traffic Reduction (UK Targets) Bill.

h) *Reform of transport related taxation*: a package of 'green' fiscal measures to reduce emissions from road transport should be included in the Spring 1998 Budget.

i) *Establishment of a UK National Air Quality Forum*: to maintain an independent overview of the implementation of the Strategy and progress towards achieving its objectives.

3. NSCA Cleaner Fuels Forum

One of the specific issues raised by the DETR's consultation paper is the issue of how to encourage the use of more environmentally-friendly fuels. The NSCA is currently coordinating a roundtable initiative on the subject of cleaner fuels, which brings together representatives of all of the major stakeholders involved. The terms of reference for this project are to review:

- the range of fuels *currently* available and their emissions characteristics;
- the optimum mix of *future* cleaner fuels;
- their potential to contribute to air quality management in the UK;
- policy options for encouraging their uptake, where appropriate.

The report of the Cleaner Fuels Forum, *Cleaner Air: the Role for Cleaner Fuels*, is published in February 1998; the Executive Summary has been circulated with this issue of *Clean Air*.

4. Transport Noise

The NSCA considers the failure to acknowledge, within the consultation paper, the importance of transport noise as an environmental and quality of life issue to be a major omission. Any attempt to move toward a less environmentally damaging, more sustainable, transport system will inevitably need to confront the problem of noise pollution. Noise nuisance from transport, and from road transport in particular, is extremely pervasive. This is also an area where the UK has a relatively poor record in comparison with many of our more progressive European partners, who have been more willing to invest in noise abatement measures such as noise barriers and low noise road surfaces.

The NSCA was somewhat reassured by the Parliamentary Under Secretary of State's, Angela Eagle MP, speech to the Society's "Noise Update 1997" seminar last September, in which she indicated that the issue of transport noise would be given due prominence in the forthcoming Transport White Paper (see *Clean Air*, January/February 1998, Vol. 28, No. 1).

The Society considers that the White Paper provides an important opportunity to make substantive progress on transport noise issues - for road, rail and air transport - which the Government should seize. As a first step the Government should accept recommendations 21 to 25 of the Royal Commission on Environmental Pollution Eighteenth Report, "Transport and the Environment", which are concerned with reducing noise nuisance from transport. In addition, the Society would like to see further progress on:

a) the development of quality of life/effects based standards for exposure to environmental noise;

b) the development of appropriate and affordable techniques for noise mapping;

c) research into the possible synergies between the noise mapping and the techniques of local air quality review and assessment.

NSCA STAFF

Congratulations to the Scottish Division's Clare Carruthers and husband Stuart on the birth of Alexandra - who arrived on Christmas Day.

Good-bye to the Brighton Office's Malcolm Eames, who left NSCA on 23 January to join the Science Policy Research Unit at the University of Sussex.

UPDATE

AUDIBLE INTRUDER ALARMS

Since 1982 the *Code of Practice on Noise from Audible Intruder Alarms* has provided guidance on the installation and operation of alarms to minimise misfiring and to facilitate their disarming with the minimum of difficulty. Where alarms misfire and a keyholder cannot be contacted, local authorities in England can use the statutory nuisance powers in Part IV of the *Environmental Protection Act 1990* to deal with the resulting nuisance. Under the *London Local Authorities Act 1991*, London Boroughs can adopt a free-standing set of provisions, many of which govern the 1982 Code. Similar provisions exist in the *Noise and Statutory Nuisance Act 1993*, but these have not so far been commenced.

Temple Environmental Consultants have been appointed by the Department of the Environment, Transport and the Regions (DETR) to carry out a comprehensive survey of all local authorities in England and Wales regarding the audible intruder alarms. The aims of the survey are to:

- consider the advantages and disadvantages of the legislation available to London authorities compared to those outside London;
- to consider the advantages and disadvantages of commencing the audible intruder alarms provisions of the *Noise and Statutory Nuisance Act 1993*;
- to explore options for a new statutory or non-statutory approach to the problem.

The study will be completed by the end of March and the results will be made available to all local authorities who respond to the survey.

For further information contact Colin Stanbury or Mark Southwood at Temple Environmental Consultants, Tel: 01825 712004; fax: 01825 712542.

DON'T CHOKE BRITAIN 1998

Many NSCA members participated in the Don't Choke Britain initiative last year. With the new powers for local air quality management, we hope that even more organisations will get involved this year - particularly local authorities who can use DCB as part of their Local Air Quality Strategies for raising public awareness.

DCB runs throughout June '98 and includes National Bike Week (6-14 June), Green Transport Week (13-21 June) and National Car-Free Day (16 June). NSCA's contribution includes two seminars - one in London on European Air Quality (date to be confirmed), and another in Birmingham on Public Information and Air Quality Management (16 June). Plus, NSCA will have its usual range of information leaflets available for members to use in their own campaigns. DCB is producing an action pack - request a copy from DCB c/o Local Government Association, 35 Great Smith Street, London SW1P 3BJ.

SUSTAINABLE WASTE MANAGEMENT

The House of Commons Environment sub-committee is holding an inquiry into sustainable waste management, with particular reference to the following issues:

- the environmental impact of different waste management options and the validity of the waste management hierarchy;
- the environmental validity of the EC and UK targets and the likelihood of achieving them;
- the impact of recent and proposed legislation such as the landfill tax and packaging Directive on performance against EC and UK targets;
- the role to be played by different waste management options in future UK strategy;
- the need for additional legislation or alternative policy options to achieve a sustainable balance of waste management options;
- the roles, achievements and policies of DETR, the Environment Agency, local authorities and other public and private bodies concerned with waste management;

The inquiry will consider the matters primarily in so far as they relate to England, although relevant experience from other parts of the UK and abroad will be taken into account.

AIRBORNE PARTICLES

The Government has set up a new Expert Panel to examine the levels and sources of airborne particles in the UK. The Group will look particularly at the physical and chemical characteristics of particles and their capability to disperse over long distances. The Chairman of the Panel is Professor Roy Harrison of Birmingham University.

ACID RAIN ON THE DECLINE

New evidence published in four recent reports* to the Government show that acid rain is declining in the UK. The reports suggest the fall is due to tough emissions controls both in the UK and in Europe. However, the reports by the Review Group on Acid Rain and the Critical Loads Advisory Group warn there is no room for complacency: while emissions of sulphur dioxide are falling, emissions of

nitrogen oxides - the other main component of acid rain - have not yet begun to decline in the same way. The Expert Groups also estimate that, at present, acid deposition exceeds critical loads - set to protect sensitive ecosystems - in up to half of the area which these ecosystems occupy in Britain. While the situation is predicted to improve by 2010, many sensitive areas will still be at risk from damage from acid deposition.

* *Acid Deposition in the United Kingdom 1992-94*, Review Group on Acid Rain. *Mapping and Modelling Environmental Acidification in the United Kingdom; Deposition Fluxes of Acidifying Compounds in the United Kingdom; Critical Levels of Air Pollutants for the United Kingdom* - all produced by the Critical Loads Advisory Group. All four reports are available from the DETR Publications Despatch Centre, Blackhorse Road, London SE99 6TT; tel: 0181 691 9191.

CLIMATE CHANGE

After three days of intense negotiations last December in Kyoto, Japan, government ministers from around the world agreed to cut emissions of the six main greenhouse gases.

The Protocol, which was endorsed by 160 nations but still requires ratification before it can come into force, commits developed countries to a 6% reduction in greenhouse gases below 1990 levels between 2008 and 2012. The European Union's reduction figure will be 8%, America's 7% and Japan's 6%. The Protocol covers all greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

The UK remains committed to its aim of a 20% cut in carbon dioxide which will be delivered by promoting greater energy efficiency, renewable forms of power generation, and development of an integrated transport policy.

ENVIRONMENTAL HEALTH MANAGEMENT

The Environmental Health Division of the former Robens Institute at the University of Surrey and the Department of Environmental Management at Farnborough College of Technology have amalgamated to form the Robens Centre for Public and Environmental Health at the University of Surrey.

The Robens Centre's studies will focus on how the quality of the environment influences the health and well-being of the population at large. It will achieve this goal through fundamental and applied research and by the provision of eduction and training throughout the world.

The RCPEH is a World Health Organization Collaborating Centre for the Protection of Drinking Water Quality and Human Health.

For further information contact Dr. Gareth Rees, 01483 259209.

NOISE AWARENESS DAY

Noise Awareness Day 1998 will be Wednesday 1 July. Suggestions for events and activities at local level will be sent to all local authorities nearer the time.

AQ INFORMATION

In November, the Government launched its new public information system for air pollution. Air pollution bandings (see box) now reflect the latest evidence on the effects of air pollutants on health.

Air Pollution Bandings

Description "...air pollution"	"low"	Standard Threshold "moderate"	Information Threshold "high"	Alert Threshold "very high"
Sulphur Dioxide (parts per billion, 15 minute average)	less than 100	100-199	200-399	400 or more
Ozone (parts per billion)	less than 50ppb (8 hour running average)	50-89 (hourly average)	90-179 (hourly average)	180 or more (hourly average)
Carbon Monoixde (parts per million, 8 hour running average)	less than 10	10-14	15-19	20 or more
Nitrogen Dioxide (parts per billion, hourly average)	less than 150	150-299	300-399	400 or more
Fine Particles (micrograms per cubic metre, 24 hour running average)	less than 50	50-74	75-99	100 or more

MEMBERS NEWS

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

Four NSCA members - **London Transport Buses, Walsall MBC, City of Westminster** and **Johnson Matthey** - were involved with recent trials of heavy-duty trucks and buses at Millbrook Proving Ground. A number of diesel, gas and exhaust after-treatment technologies were put through a new test cycle designed to replicate real-world operating conditions for vehicles such as refuse collection vehicles and buses. A combination of oxidising catalyst and city diesel reduced emissions from older buses very effectively; good results were also obtained using compressed natural gas with oxidising catalysts, and liquefied petroleum gas with three-way catalysts. Walsall's refuse truck, using city diesel and a continuously regenerating trap, also showed impressive reductions in emissions of fine particles. Some of the test vehicles are shown below.

Luton Borough Council is launching an automated phone message service which gives hourly-updated information on air quality, weather and sunshine levels in Luton. The data comes from the council's monitoring station and is transferred to a computer, which receives calls from the public. Callers are also given health advice about poor air quality and sunburn.

Leeds City Council has achieved its target of cutting CO_2 emissions by 15% over five years, according to its latest environmental performance report. The council has also made progress in environmental purchasing, recycling waste and using locally-made compost instead of peat in city flower-beds. The use of travelcards and a 14p per mile cycling allowance cut officers' vehicle mileage by an impressive 10% last year.

The **University of the West of England** has set up an Air Quality Management Resource Centre for air quality managers in the West of England. The Centre includes a reference library and will be organising meetings and training events.

Several NSCA members have won Community 21 Awards to support Local Agenda 21 projects. These include: **Cambridge CC** for a subsidised water butt scheme; **Bradford MDC** for a garden improvement scheme; **Forest of Dean DC** for a local food directory; **LB Sutton** for a charcoal-making project, and **Reading BC** for a credit union to help low income families out of fuel poverty.

Divisional News

The **West Midlands Division** enjoyed the hospitality of environmental consultants Aspinwall & Co at their Shrewsbury headquarters. Members engaged in lively debate with Dr David King of the Environment Agency on the relative role of the Agency and local authorities in the proposed IPPC industrial pollution control regime. Presentations were also given by Richard Carpenter and Mandy Stoker of Aspinwalls, Gavin Tringham of Birmingham City Council, and Tim Brown of NSCA. After the meeting, members saw a demonstration by Technos Ltd of LandProbe, a mobile sampling unit for contaminated land and landfill sites (see photo). Outgoing Divisional Chairman Bill Hancox was presented with a Certificate of Commendation by Steve Norman, for all his hard work on behalf of the Division. (see photo on next page).

The Boots Chemical Company plant at Beeston was the venue for a meeting of the **East Midlands Division**. Paul Stone of Boots gave a presentation on the company's environmental policy and the use of a 15 MW combined heat and power plant on the site. Nigel Carse of Boots Logistics spoke on Boots' experience with cleaner fuels and green commuter plans. Finally Stewart Hodkin of the Environment Agency introduced a video on waste minimisation. In the afternoon members visited the Boots energy centre, toiletries factory and museum.

The Division also visited the Coalite Smokeless Fuels plant at Bolsover, where they heard a presentation from Brian Ashall, Managing Director of Coalite. Malolm Chattwood of Derbyshire Dales DC and Philip Woodward of Chesterfield BC both gave reports on local research into PM_{10} emissions undertaken as part of the DETR-funded "first phase" local authority programme. After lunch members toured the Coalite plant.

Elsewhere...

Pop fans will be glad to hear that singer Neneh Cherry is undertaking the world's first **carbon-neutral concert tour**. A carbon dioxide budget, including road transport, flights, electricity used during concerts, fans travelling to the gigs and hotel accommodation, suggests that the tour will emit 2000 tonnes of CO_2. On the basis that it takes the planting of five trees to soak up four tonnes of CO_2, Ms Cherry will be planting 2,500 trees around the UK. Fearlessly mixing metaphors, she says: "It's time to replenish the pond. Aggressive tree planting programmes are vital. We need to clean the air we breathe". So, watch out for aggressive tree planters - planting cherry trees, presumably.

The carbon audit scheme is run by Future Forests (01963 350465), and is attracting interest from a diverse range of organisations who want to offset their emissions, including Formula One racing, advertising agency J Walter Thompson and folk-punk group the Levellers. Future Forests has estimated the **carbon emissions for last year's Kyoto conference** on climate change as follows:

- 10,000 delegates average 10 hour flight each @ 25kg per hour = 2,500 tonnes of carbon;
- Hotel accommodation = 800 tonnes;
- Conference = 200 tonnes;

Total: 3,500 tonnes.

Apparently this would require the planting of 18,000 trees at a cost of £54,000 to balance the carbon emissions.

NSCA Divisional Meetings

Information about these events is available from Divisional Secretaries. Contact numbers are on p38.

East Midlands

26 February: Visit to British Geological Survey
25 June: AGM, Rolls Royce, Derby
17 September: Severn Trent Water, Cropston Visitors Centre

South East

19 May: AGM

FUTURE EVENTS

1-3 MARCH - The Environment: A Consumer Choice
This conference will look at ways to increase public interest and participation in more environmentally sustainable lifestyles, particularly issues surrounding recycling and waste minimisation.
Venue: City Hall, Cardiff.
Details: Save Waste & Prosper. Tel: 0113 243 8777. Email: swap@geo2.poptel.org.uk

2-3 MARCH - Pollution Risks
How to assess, insure and manage new and emerging environmental liabilities.
Venue: The Strand Palace Hotel, London.
Details: Becky Stene & Gemma Wall, IBC Conferences, Fax: 0171 323 4298; Email: becky.stene@ibcuk.co.uk

18-20 MARCH - Working with your Stakeholders: Resolving Conflict and Building Consensus on Environmental issues
Three day management development course aimed at providing skills and confidence to involve stakeholders in environmental decision making.
Venue: School for Policy Studies, Bristol.
Details: Freya Levy, The Environment Council. Tel: 0171 881 7614.

22-24 APRIL - CEM 98: International Conference on Emissions Monitoring
Latest developments in manual and continuous emissions monitoring techniques and environmental legislation; requirements, benefits and problems associated with implementing emissions monitoring in real industrial situations.
Venue: National Physical Laboratory, Teddington, Middlesex.
Details: NPL Conferencing, Tel: 0181 943 6400; Email: robert.angus@npl.co.uk

18-20 MAY - Course: Environmental Stakeholder Dialogue
Part 1 of intensive six day sandwich training course for facilitators, mediators and process managers providing a thorough grounding in consensus building, aimed at giving them confidence to start using it in meetings, workshops and round tables. Part 2 from 6-8 July.
Details: Freya Levy, Environment Council, Tel: 0171 881 7614.

18-21 MAY - Atmospheric Dispersion Modelling
Fifth international conference on harmonisation within atmospheric dispersion modelling for regulatory purposes.

Venue: Rhodes, Greece.
Details: John Bartzis, INTRP/Environmental Research Laboratory, 15310 Aghia Paraskevi Attikis, Greece; Fax (+30 1) 6533431; Email: 5harmo98@avra.nrcps.ariadne-t.gr

31 AUGUST - 2 SEPTEMBER - Urban Transport & the Environment for the 21st Century
Fourth international conference providing an opportunity for the exchange of information among all those working on urban transport studies and those involved with transport policy.
Venue: Lisbon, Portugal.
Details: Wessex Institute of Technology. Tel:L 01703 293223; Email: Paula@wessex.ac.uk

13-18 SEPTEMBER - 11th World Clean Air & Environment Congress
The contribution of developing countries to regional and global air pollution is likely to become increasingly significant; while developing countries may take note of environmental management and technology of developed countries, it is important for them to maintain sustainable development. However, the interface between developing and developed countries must bring about the evolution of appropriate international environmental management.
Convened by the International Union of Air Pollution Prevention and Environmental Protection Associations (for which NSCA provides the secretariat), and hosted by the National Association for Clean Air, South Africa.
Venue: Durban, South Africa.
Details: Ammie Wissing, PO Box 36782, Menlo Park, 0102 South Africa. Fax: +27 12 348 1563. Email: wissing@iafrica.com

FORTHCOMING NSCA EVENTS

Tuesday 10 March 1998
Training Seminar (with SEIPH) - London
Public Register to Part B Emission Inventory

Thursday 26 - Friday 27 March 1998
Spring Workshop - Abingdon
Air Quality Reviews - and Beyond

Monday 27 - Tuesday 28 April
Training Seminar (with SEIPH) - London
Estimating Road Traffic Emissions

Wednesday 10 June 1998
Workshop - London
UK Dispersion Model Users Group

Tuesday 16 June 1998
Training Seminar - NEC Birmingham
Public Information and Air Quality

Tuesday 15 September 1998
Training Seminar - NEC Birmingham
Noise Update 98

Monday 26 - Thursday 29 October 1998
Annual Conference and Exhibition - Weston-super-Mare
Environmental Protection 98

For list of forthcoming
Divisional meetings and events see page 79

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 Fax: 01273 735802

nsca

CLEAN AIR
AND ENVIRONMENTAL PROTECTION

May/June 1998

- NSCA - Priorities for a Second Century
- Secondary Particle Contribution to Elevated PM_{10} Concentrations
- Techniques for a Second Stage Air Quality Review

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CONTENTS

The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

NATIONAL SOCIETY FOR CLEAN AIR AND ENVIRONMENTAL PROTECTION
(Founded 1899)
Registered Charity, Number 221026

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19 Oxgate Gardens, Brent, London NW2 6EA

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EDITORIAL

Preparations for a Second Century

In less than 12 months NSCA begins a year of celebration to mark its centenary. Since the Society is, almost certainly, the oldest national body in the world promoting pollution control, the occasion will have wider significance than for its membership alone.

In surveying where the Society has come from, many will inevitably ask where it is now going, as it moves into a second century. Policy debate within the Society has usually been lively and relevant, so answering that question would seldom have been difficult, but catching the mood of the moment the Society's Council has been reviewing with particular care the full range of the Society's policies and priorities, across the whole field of environmental protection which the Society now embraces.

An article in this issue (see page 84) summarises the results of discussions within the Society's Council and specialist committees on key policy priorities and initiatives that have been considered recently. A further report will follow, on other issues, later in the year. These policies are in no sense cast in stone: in fulfilling its role the Council is dependent on suggestions and feedback from individual members.

The centenary will cast a spotlight not only on what the Society aims to do, but also the way it does it. Elsewhere in this issue (see inside back cover) is the forward meetings programme for 1998/9, which now includes not only the Annual Conference and the scheduled range of training events, but a wider series of national conferences and a new programme of policy seminars.

From the start of the centenary year members and readers should also expect to see a range of changes in the Society's publications and other materials, as part of the continuous process of ensuring that their style and presentation are as relevant and up-to-date as their substance. The Trustees will welcome suggestions and feedback from members on matters such as programme and communications, to help them ensure the Society enters its centenary year in determined and robust good health.

NSCA NEWS & VIEWS

PRIORITIES FOR A SECOND CENTURY

Developing NSCA Policy

As the Society begins preparations for the celebration of its centenary, the Secretary General summarises the outcome of recent discussions on policy development within Council and specialist Committees, discussions which it is intended should culminate in the course of the centenary year in the publication of a 'Forward Vision' report covering the full range of the Society's policy concerns.

Introduction

The National Society for Clean Air and Environmental Protection is the world's oldest national anti-pollution group. It will shortly enter its centenary year. This is an important milestone, and a natural occasion for the Society to take stock of its policy priorities, looking both backwards and forwards.

The last few years have seen significant progress in the Society's long-standing goals for air quality, notably through the UK National Air Quality Strategy and recent EU Directives. Priorities for air quality need to be reviewed in this light. Equally important, however, is the need to review policy priorities and commitments across the other areas of pollution control also within the Society's remit and where, in some cases, progress has been slower and new pressures have been emerging.

This paper summarises preliminary conclusions emerging from discussion within the Society's Council and specialist committees, and the steps taken by the Council of the Society to respond to them. It is not the complete story, so much as a situation report on a process of review and development which will continue up to and beyond the start of the centenary celebrations later this year.

National Policy Issues - Sustainable Development

As one of the UK's most respected environmental organisations, the Society will continue to play an important role in influencing broad environemental policy objectives at national level, and contribute fully to discussions on the UK strategy for sustainable development.

Air Quality - Onwards from the Strategy

The National Air Quality Strategy is a major step forward. The NSCA has also welcomed the adoption by the Government of the Society's proposals for the reform of public information and air quality bandings systems. However such progress, though welcome, will not at a stroke solve all the UK's air quality problems. There remain major matters to be addressed, to which recent Government reports on the health impacts of air quality give urgency.

With the Strategy and the new public information system now adopted, the NSCA will work for progress on four main fronts:

- Promotion of good practice in local air quality management, particularly through training and information. The Society's Air Quality Management Committee provides a forum for coordination and development of training and good practice by the many public, private and academic bodies with an interest in the field. The Society is committed to ensuring that this continues and is effectively resourced and supported;
- The Society supports Ministers' proposals for the Review of the Strategy. But in its submissions it has made clear that this must not be an occasion for diverting energy into debate on minor adjustments to targets and standards, when the key need is to secure early action;
- The Society has already set out the new policies it considers are required in its submission on the Strategy Review; in particular, NSCA has identified a range of measures to strengthen local authorities' capabilities to implement the Strategy, as well as wider changes to fiscal and regulatory regimes. The Society welcomes indications that the Government is seriously considering some of these within its Integrated Transport Policy Review, notably the Society's proposals for environmental zones (low-emission zones), regulation of non-residential parking, environmental performance standards for fleets and public service vehicles, and a radical overhaul of transport taxation in the light of environmental criteria;
- The Society also welcomes Ministers' decision to go ahead with the National Air Quality Forum proposed in the original Strategy. The Society agrees that such a forum cannot be, and should not attempt to be, a policy-making body. Like the NSCA, its primary role should be consensus-building among the wide range of stakeholders in this field. While a key role should be as a consultative body on the review of the Strategy, the NSCA will seek to ensure that the Forum takes a long-term view of needs and capabilities for the furtherance of the Strategy, and to ensure readiness to tackle new air quality issues as they arise.

At the same time the wider implications of the Strategy process for environmental policy should be recognised. The Society is committed to a rational and balanced approach to environmental policy-making, and therefore welcomes the way in which the Strategy promotes:

- a properly integrated and balanced relationship between national and local policies;
- the articulation and systematic pursuit of environmental standards and clear targets, based on scientific and health criteria;
- a systematic attempt to measure and forecast the contribution of individual policies to achievement of those targets.

Lessons from the Strategy and from the Strategy-making process, therefore need to be fed into other relevant areas of environmental policy making.

Noise

Through its National Noise Committee, the Society will now be encouraging, in respect of environmental noise, the development of approaches and techniques similar to those developed for air quality management. Priority has been given in recent years to neighbour noise issues. Policy there will need further review, as Ministers accepted at the time of the enactment of the Noise Act, but the main priority now should be to shift the focus to the need for a wider strategy on environmental noise. The intensification of use of existing roads, which will result from the reduction in the roads programme, and the Government's decision to concentrate development in particular on brown-field urban sites, is bound to increase noise levels in many sensitive urban areas. The Society will press strongly to ensure that the implications of this are faced.

The UK's failure so far to develop a coherent long-term noise strategy means that it was in a relatively weak position in EU discussions on the Commission's Noise Green Paper. Subsidiarity considerations may rule out some of the options that have been raised for action at EU level, but this cannot be a justification for inaction at national level. The Society urges the development of a coherent UK National Noise Strategy through progressive steps on three fronts:

- Noise mapping need not be costly and bureaucratic, and the entire country does not have to be covered in one fell swoop. It is essential the Government adopt a positive and coherent approach to its development as the only logical long-term basis for policy and planning;
- The same weighing of technical, regulatory and social policies that marked the Air Quality Strategy needs now to be deployed to find optimal practical and cost-effective ways forward to a coherent strategy;
- Noise impacts must play a clearer and more transparent role in transport planning and other policies. It is essential that the process of integrating policies be strengthened.

Local Environment Management

As the process of developing the Air Quality Strategy has shown, environmental policies at local level have to be effectively integrated. The links among the various local environmental services are close, and they are often subject to the same problems and pressures. Local authorities have pioneered corporate and integrated approaches but, within the prevailing institutional and policy frameworks, the extent to which environmental considerations are penetrating other functions, and the extent to which environmental services themselves are effectively coordinated needs further consideration. More widely Local Agenda 21 has proved valuable, but generalisable conclusions are difficult to discern, and the process risks losing its way. There remains a need to strengthen local authorities as the voice for, and manager of, the local environment, a task on which the Government has not yet adequately embarked. The process of managing the local environment - not only the delivery of local environmental services but the wider environmental role of local authorities, and also its interaction with the voluntary, business and other sectors - therefore needs further review, with the aim of promoting practical management for sustainability.

The Society has therefore established, as one of its priorities, a Local Environment Management Forum, intended to draw together a wide range of organisations and interests concerned with the local environment, to promote discussion and action on practical management for sustainability, including:

- Key cross-cutting issues relating to local authority services, such as powers, resources, relations with central government, and enforcement capabilities;
- Better understanding of principles of sustainability, and the way in which these can inform and guide local authority action and link it with other processes and stakeholders;
- The potential contribution of environmental management systems.

Through the course of its centenary year, the Forum's Steering Group has three main priorities:

- A coordinated response to Government consultations on public health, sustainable development strategy, and - in due course - local authority powers. Unless these three are effectively linked, a major opportunity will be lost;
- As part of its contribution to the marking of the Society's centenary, the Forum will be concerting a 'Forward Vision Report' on management of the local environment;
- Following the Society's urging that sustainability should

be pursued at regional level, and the proposal that Regional Development Agencies should be Regional Sustainable Development Agencies, the Society will promote debate on action at the regional level that can complement and reinforce enhanced local authority powers.

International Atmospheric Issues

The Society has again considered whether it should put more effort into major international atmospheric issues such as climate change. Given the large number of bodies now active on international climate issues, it has concluded that it should not do so, but it remains committed to supporting the effective tackling of climate change issues, and will do all it can to reinforce and support the work of relevant bodies, notably in the UK Climate Action Network. However, the Society remains particularly well placed to pursue acidification issues. It will therefore focus in particular on the interface of acid deposition control policies with global warming and energy policy generally.

At a more general level, the Society's work on acidification will be expanded, through a dedicated Task Force, to review the current understanding of acid deposition impacts and recovery prospects and, in particular, to encourage strengthening of the scientific and technical processes underpinning work within UNECE and the EU, so as to take better account of economic and industrial considerations and contribute in particular to the resolution of the major problems of the Eastern areas of the Continent.

Industrial Regulation and the Barriers to Cleaner Technology

A major new element of the Society's work will focus on barriers to the adoption of cleaner technologies. Air pollution control systems have been at the core of wider environmental regulation and about a third of the Society's corporate members are industrial or commercial bodies coping with the challenges of minimising environmental impact while enhancing economic and industrial activity. In line with its interest in the future of industrial regulation, the Society has taken a key interest in the IPPC Directive, and it was at its joint conference with the CBI that the Government's original consultation proposals were announced.

The Society sees its further contribution focused on a new Working Group to review the future of industrial regulation. The Group will assess long-term trends in industrial regulation, the potential contribution of other policy instruments, and with the aim in particular of finding ways to reduce barriers to cleaner technology. The Group brings together representatives of environmental and regulatory interests, mainstream industry, as well and suppliers of environmental technologies and services.

IPPC CONSULTATION

In January the DETR published its second consultation on implementation of the Integrated Pollution Prevention and Control (IPPC) Directive; this consultation dealt primarily with the role of local authorities; how to take into account the wider costs and benefits of certain strategic pollution control decisions; the future of sectoral affordability; site restoration and waste management issues; the role of guidance/general binding rules; and permit reviews and the handling of changes to regulated installations.

In its response (copies of which are available from Sally May), NSCA made a number of detailed comments and recommendations. In particular, NSCA

- considers that regulatory control should be divided between the Environment Agency and local authorities, but with the division based on wider considerations than the paper addresses;
- considers that the proposal for the Agency to assume control of new processes as a transitional measure should not proceed;
- supports the proposed strengthening of guidance notes and powers for the Secretary of State to determine cases of strategic significance;
- welcomes the commitment to take powers to promote voluntary agreements and to consult further on EMAS and related issues.

NATIONAL NOISE AWARENESS DAY

A reminder that NAD is on Wednesday 1 July this year. It is hoped that this year's event will build on the success of last year's event, and that local authorities, community gorups and schools across the country will once again get involved in promoting a responsible attitude towards noise. Activity packs will be sent out at the end of April.

Contact Mary Stevens at NSCA with ideas and suggestions, or for further information.

NSCA WEBSITE

NSCA now has its own website at http://www.mistral.co.uk/nsca. This will be updated regularly to provide information on policy, publications and events.

AIR QUALITY

The Secondary Particle Contribution to Elevated PM_{10} Concentrations in the UK

John R Stedman
AEA Technology plc
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The UK Expert Panel on Air Quality Standards has recommended an air quality standard for PM_{10} of 50 μgm^{-3} measured as a 24-hour running mean. The UK Government has set an objective within the Air Quality Strategy that this standard should be achieved in the UK by 2005 at the 99th percentile. That is, no more than four days should exceed this concentration for a full year's monitoring. It is clear that this is a demanding target and in order to understand whether or not it can be achieved, it is important to determine the influence of the long range transport of secondary particles into the UK on PM_{10} concentrations.

This report presents a method to distinguish between the primary and secondary particle contributions during periods of elevated PM_{10} in the UK by comparing measurements from different national monitoring networks. An analysis of concentrations during the period January to March 1996 is presented along with a demonstration that the results of this analysis can be successfully applied to other periods. The frequency of PM_{10} episodes with a significant secondary particle contribution is then examined along with a discussion of the implications of these findings for the Air Quality Strategy objective for PM_{10}.

The early part of 1996 was exceptional in terms of the magnitude and duration of the secondary particle contribution to PM_{10} episode concentrations in the UK. Periods with significant contributions to PM_{10} from secondary particles do occur each year however, in both summer and winter.

Concentrations of both primary and secondary particles are expected to be lower in 2005 compared with current levels due to emissions reductions. It is expected that by 2005 in most years secondary particle episodes alone will not lead to any days with PM_{10} concentrations in excess of 50 μgm^{-3}. In a year such as 1996, however, it is likely that concentrations will exceed this standard on about two days due to elevated secondary particle concentrations. An examination of daily sulphate measurements from 1987 to 1996 indicates that years with concentrations similar to those in 1996 may occur every five to ten years.

Introduction

PM_{10} airborne particulate matter may be either primary or secondary in its origins. Primary combustion related particles are emitted directly into the atmosphere from sources such as road traffic, coal burning and industry. Road traffic related sources of PM_{10} contribute about 25% of the annual total emissions taking the UK as a whole (Salway *et al*, 1997). The percentage in urban areas is extremely variable, depending on the presence or absence of major industrial sources. Recent emission inventories compiled for urban areas in the UK (Hutchinson and Clewley, 1996, Buckingham *et al*, 1997) have estimated percentage contributions from road traffic ranging from 8% in Merseyside to 58% in the West Midlands. The percentage is likely to be even higher in London. Regression analysis comparing measured PM_{10} concentrations with those of CO have indicated that traffic exhaust related sources contribute about 40-50% of the measured winter mean PM_{10} concentrations in UK cities (QUARG, 1996). This contribution can be greater during winter episodes of elevated concentrations due to poor dispersion of local primary emissions. There can also be a contribution to primary PM_{10} from coarse particles from non-combustion related sources such as wind blown soil and dust and sea spray.

Secondary particles are formed within the atmosphere by the oxidation of sulphur dioxide and nitrogen oxides to form sulphate and nitrate particles. The contribution of secondary particles to measured PM_{10} is much more uniform across the country than that of primary particles because the secondary particles are formed relatively slowly in the atmosphere and have a long atmospheric lifetime.

PM_{10} concentrations are monitored in the UK national air quality monitoring networks using Tapered Element

Oscillating Microbalance (TEOM) instruments (Bower et al, 1996). Monitoring of PM_{10} commenced in 1992 and by 1996 were being monitored at over 20 sites.

The UK Expert Panel on Air Quality Standards has recommended an air quality standard for PM_{10} of 50 μgm^{-3} measured as a 24-hour running mean (EPAQS, 1995). The UK Government has set an objective within the Air Quality Strategy that this standard should be achieved in the UK by 2005 at the 99th percentile (DoE, 1997). That is, no more than four days should exceed this concentration for a full year's monitoring. It is clear that this is a demanding target and in order to understand whether or not it can be achieved, it is important to determine the influence of the long range transport of particles into the UK on PM_{10} concentrations.

This report presents a method to distinguish between the primary and secondary particle contributions during periods of elevated PM_{10} in the UK. An analysis of concentrations during the period January to March 1996 is presented along with a demonstration that the results of this analysis can be successfully applied to other periods. The frequency of PM_{10} episodes with a significant secondary particle contribution is then examined along with a discussion of the implications of these findings for the Air Quality Strategy objective for PM_{10}.

PM_{10} Concentrations During the Period January - March 1996

There were two geographically widespread and prolonged episodes of elevated PM_{10} concentrations during the period January to March 1996: the first in late January and early February and the second in mid March. Figure 1 shows the importance of this period in contributing to the total number of days with concentrations greater than or equal to 50 μgm^{-3} during 1996. At many sites more than three quarters of these days were during these three months and at almost all sites more than half of the episodes were confined to this period.

Secondary particles formed the main contribution to the high concentrations during these episodes. This has been demonstrated by the comparison of urban concentrations with those in rural areas (King and Dorling, 1997, Stedman, 1997) showing that urban and rural concentrations were similar during these episodes. In addition, the PM_{10} concentrations in urban areas during these episodes did not show the type of strong diurnal variation that would be associated with the poor dispersion primary particles from local combustion sources. King and Dorling (1997) and Stedman (1997) also pointed out that these episodes were characterised by winds from the east bringing long range transported secondary particles to the UK from the continent. This transport is well illustrated by the 96-hour air mass back trajectories for 14 March 1996 shown in Figure 2.

The contributions to ambient PM_{10} concentrations from primary, secondary and coarse particles can be analysed by comparison of measurements from different Department of the Environment, Transport and the Regions (DETR) monitoring networks. Daily PM_{10} measurements are compared with daily black smoke measurements in Figure 3. Network daily mean PM_{10} concentrations over the whole of the UK have been calculated for 20 automatic monitoring sites within the DETR monitoring networks, which are mostly in urban areas. Network daily mean black smoke concentrations have been calculated from the more than 200 sites within the DETR smoke and SO_2 monitoring network (Stevenson *et al*, 1995), which are also mostly in urban areas. Concentrations of black smoke were determined by reflectance of filter samples and represent fine combustion particles of diameter less than about 4 µm. Black smoke measurements therefore provide a good indicator of combustion related primary PM_{10} concentrations. The elevated concentrations of PM_{10} on 15 and 16 January and 28 February 1996 corresponded with elevated black smoke concentrations, indicating that there was a significant contribution to PM_{10} from combustion related primary particles on these days. Black smoke concentrations during the two prolonged PM_{10} episodes were, however, low indicating that combustion sources were not making the dominant contribution to these episodes.

Figure 4 shows the network mean particulate sulphate concentrations during this period. The daily mean concentration was calculated for the network of eight rural sites shown in Figure 5. These sites are equipped with similar monitoring equipment to that deployed at Smoke and SO_2 monitoring sites (RGAR, 1997). Sulphate concentration on the filters was determined by ion chromatography; these measurements therefore represent sulphate particles of diameter less than about 4 µm. It is not possible to assess the detailed spatial variability of concentrations from measurements at this space network of eight sites but the concentrations of secondary particles can be expected to be relatively uniform due to their long atmospheric lifetime. It is clear from a comparison of Figures 3 and 4 that particulate sulphate measurements provide an excellent indicator of the secondary particle component of PM_{10}.

If the primary combustion contribution to daily PM_{10} concentrations is removed from the total PM_{10} concentration by subtracting the black smoke concentration, then what is left is a non-combustion component: a combination of secondary particles and coarse particles. Figure 6 shows a scatter plot of this parameter plotted against the daily sulphate concentrations. This shows the following:

- There is a clear relationship between the non-combustion component of PM_{10} and the sulphate concentration. Sulphate is providing a good indicator of the concentration of secondary particles.

- The intercept of about 5 μgm^{-3} represents an approximately constant concentration of coarse particles during this period.
- The slope of about 3 shows the scaling factor required to convert sulphate measurements to secondary PM_{10} on a network mean basis. This factor is required because the measurements are of sulphate only. There will also be a counter ion such as ammonium present in addition to nitrate particles.

This factor of 3 is partly determined by the relative locations of the PM_{10}, black smoke and sulphate monitoring sites. While urban areas in England are strongly represented in both the PM_{10} and black smoke monitoring networks, the sulphate monitoring network sites are more evenly distributed, with several sites in remote areas of Scotland and Northern Ireland. This is important because there is a gradient in particulate sulphate across the country, with concentrations in southern England being more than twice those in northern Scotland (RGAR, 1997). Values in the range 2 to 2.5 are obtained if this factor is calculated on an individual site, rather than network mean basis.

This relationship therefore provides a method for illustrating the contributions to measured PM_{10} concentrations on a daily basis. A constant coarse particle concentration is assumed for each day; the combustion related primary particle concentration is represented by the concentration of measured black smoke and the secondary particle concentration is estimated by multiplying the measured concentration of sulphate by a factor of three. Figure 7 shows this method can be used to illustrate the contributions to the measured PM_{10} concentrations during the episode periods. This figure clearly shows the significant secondary particle contributions to the two prolonged episode periods and the primary particle contributions to the shorter episodes. Combustion related particles transported from distant sources will be included along with locally derived dark particles in the black smoke measurements and not in the sulphate component. It is likely, however, that local sources will tend to dominate the black smoke measurements.

The Frequency of Secondary Particle PM_{10} Episodes

The high concentrations of secondary PM_{10} during early 1996 provide an excellent dataset to establish the relationships between PM_{10}, black smoke and sulphate concentrations because of the wide range of measured sulphate concentrations. The regression relationships between these contributions to daily PM_{10} concentrations are reasonably robust and can be applied to other periods. Figure 8 shows the contributions to daily PM_{10} for 1995 and provides further illustrations of the different types of PM_{10} episodes. Elevated PM_{10} concentrations with a significant secondary particle component were measured in early May, and again in July and August. These periods were also associated with photochemical ozone episodes in the UK, in contrast with the early 1996 episodes, which were of particles only. The PM_{10} episodes in November and December were dominated by combustion sources. The high concentrations in early November were associated with Guy Fawkes Night celebrations (Clark, 1997).

A constant coarse particle concentration of 5 μgm^{-3} has been assumed for each day during 1995 in this analysis. A comparison of co-located PM_{10} and $PM_{2.5}$ measurements at an urban background monitoring site in Birmingham (Harrison *et al*, 1997) has shown that mean concentrations of coarse particles are higher in the summer than during the winter, with seasonal mean concentrations for the period 1994-1995 of 10.9 μgm^{-3} and 6.5 μgm^{-3} respectively. Harrison *et al* (1997) have also found that coarse particle concentrations at this site can be significantly higher on some summer episode days. It is also evident from Figure 8 that particle concentrations on some days during the summer of 1995 were higher than predicted by the model presented here. This additional PM_{10} is likely to have been coarse particles.

Daily network PM_{10} concentrations have been analysed in this way for 1996, 1995 and 1994 and the results are summarised in Table 1.

Table 1: The contributions to daily network mean PM_{10} (μgm^{-3}). Calculated using the relationships derived for the period January to March 1996.

Year	measured	estimated	primary	secondary	coarse	r^2*
1994	24.9	24.1	10.3	8.8	5.0	0.77
1995	24.0	23.9	10.0	8.9	5.0	0.73
1996	25.5	24.6	10.2	9.4	5.0	0.82

* the correlation coefficient between measured and estimated total PM_{10}

The early part of 1996 was exceptional in terms of the magnitude and duration of the secondary particle contribution to PM_{10} episode concentrations in the UK. Periods with significant contributions to PM_{10} from secondary particles do occur each year however, in both summer and winter, as illustrated in Figure 8 for 1995.

An examination of the secondary particle related PM_{10} episodes in the years 1994 to 1996 shows that a daily network mean sulphate concentration of about 9 μgm^{-3} (corresponding to a secondary PM_{10} concentration of 27 μgm^{-3}) can lead to a daily PM_{10} concentration in excess of 50 μgm^{-3}, which is the air quality standard. The average black smoke concentration on days with sulphate concentration above this threshold is about 17 μgm^{-3}, leading to a total PM_{10} concentration, including coarse particles of the order of 50 μgm^{-3}. Table 2 lists the number of days in each year since 1992 that the network mean sulphate concentration was at least 9 μgm^{-3}. This confirms that 1996 was the year with the most days with secondary particle related days with PM_{10} concentrations in excess of the standard but all years have some of these days.

Table 2: The number of days with network mean sulphate concentrations greater than 9 μgm^{-3} (corresponding to a network mean PM_{10} concentration greater than 50 μgm^{-3})

year	number of days
1987	14*
1988	8*
1989	6*
1990	16*
1991	13*
1992	5
1993	8
1994	3
1995	3
1996	20

* Daily concentrations 1987-1991 adjusted to be consistent with 1992-1996 values.

Particulate sulphate measurements at the full network of eight rural sites shown in Figure 5 commenced in 1987, five years before PM_{10} measurements started. The data for the earlier years do not, however, provide a direct indication of the likely return frequency of the magnitude of secondary particle episodes seen in 1996 because sulphate levels have decreased significantly in the UK since 1987 (RGAR, 1997). Mean values for the period 1994-1996 are typically about 75% of those measured in the period 1987-1989. Annual mean concentrations fell during the period 1987-1991 and then remained roughly constant. The number of sulphate episode days for each year listed in Table 2 for these earlier years have therefore been adjusted to take into account the change in concentration up to 1991. This indicates that for current levels of secondary particles, the meteorological conditions leading to episodes of the magnitude of those experienced in 1996 can be expected to occur once every five to ten years.

Implications for the Achievement of the Air Quality Strategy's Specific Objective for PM_{10}

The UK government has set an objective within the Air Quality Strategy that a PM_{10} concentration of 50 μgm^{-3}, measured as the daily maximum of running 24-hour average, should be achieved in the UK by 2005 at the 99th percentile (DoE, 1997). That is, no more than four days should exceed this concentration for a full year's monitoring.

Table 2 indicates that more than four days had concentrations in excess of this standard in 1992, 1993 and 1996 due to secondary particle episodes alone. Emissions of primary particles from the transport sector (one of the main sources in urban areas) are expected to reduce to about 50% of the current levels by 2005. The results of modelling studies (QUARG, 1996) suggest that secondary particle concentrations in the UK are likely to be of the order of 60% of current levels by 2010 as a result of Europe-wide reductions in SO_2 and NO_x emissions. Interpolating between current levels and 2010 would indicate that secondary particle concentrations in 2005 should be about 70% of current levels. Applying these reduction factors to current PM_{10} concentrations in the UK and keeping the coarse particle concentration the same leads to the conclusion that by 2005, in most years, secondary particle episodes alone will not lead to any days with PM_{10} concentrations in excess of 50 μgm^{-3}. In a year such as 1996, however, it is likely that concentrations will exceed this standard on about two days due to elevated secondary particle concentrations. An examination of daily sulphate measurements from 1987 to 1996 indicates that years with concentrations similar to those in 1996 may occur every five to ten years.

The assumed 30% reduction in secondary particle concentrations in 2005 compared with current levels is based on modelling studies of the transport and atmospheric oxidation of sulphur dioxide and oxides of nitrogen to form particles. If the oxidation process proves to be more of a limiting factor on particle formation, compared with the rate of emissions, than is assumed in the models, then secondary particle concentrations from these sources may not respond to emissions reductions to the extent that is expected. This could lead to rather higher secondary particle concentrations than anticipated here causing the specific objective for PM_{10} to be exceeded across much of the UK in some years, due to secondary particle episodes.

Acknowledgement

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Figure 1: Number of days with maximum running mean PM_{10} concentrations >= 50 μgm^{-3}

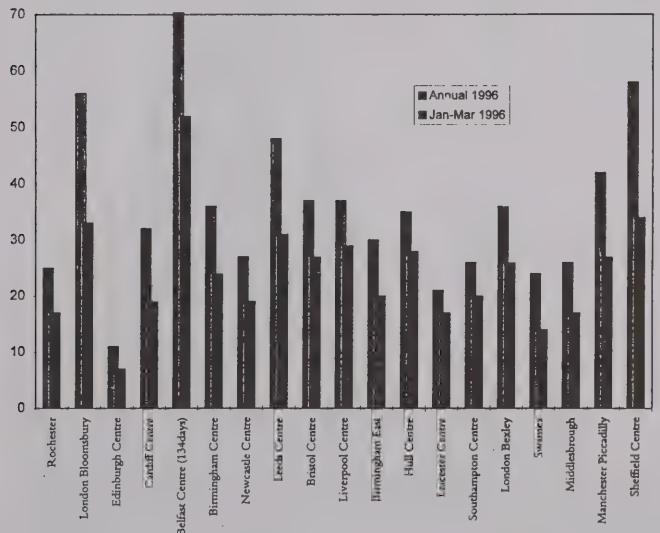


Figure 2

Figure 3: Network daily mean PM_{10} and black smoke concentrations (μgm^{-3})

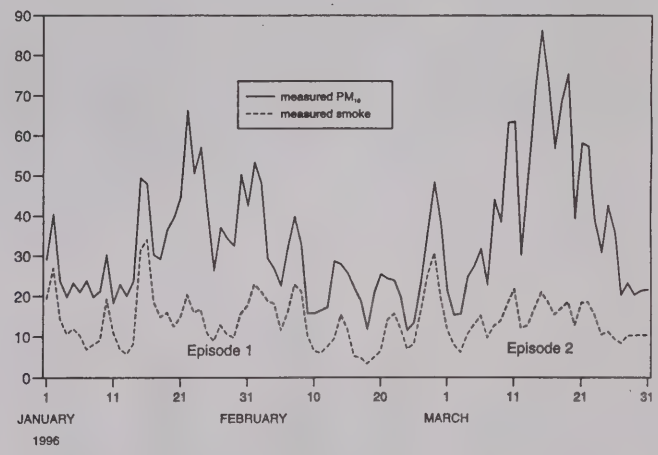


Figure 4: Network daily mean particulate sulphate concentration ($\mu gSO_4 m^{-3}$)

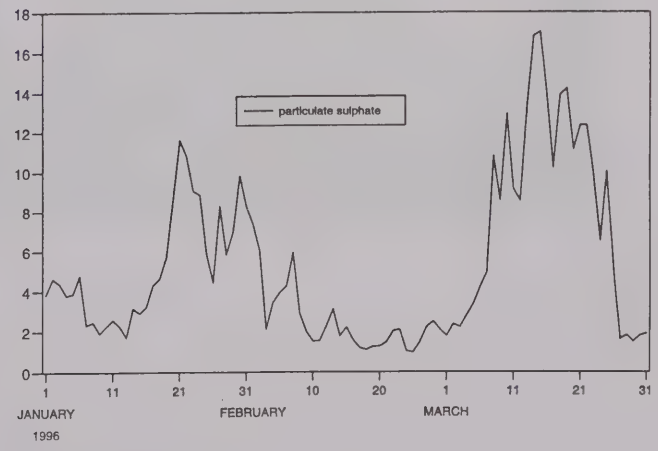


Figure 5: UK Rural Particulate Sulphate Measurement Sites

Figure 6: The relationship between daily PM_{10}, black smoke and sulphate concentrations, January - March 1996

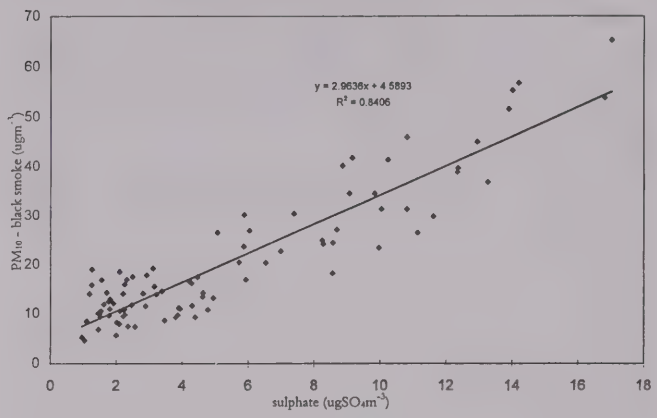


Figure 7: Network daily mean PM_{10} concentrations (μgm^{-3}). January - March 1996

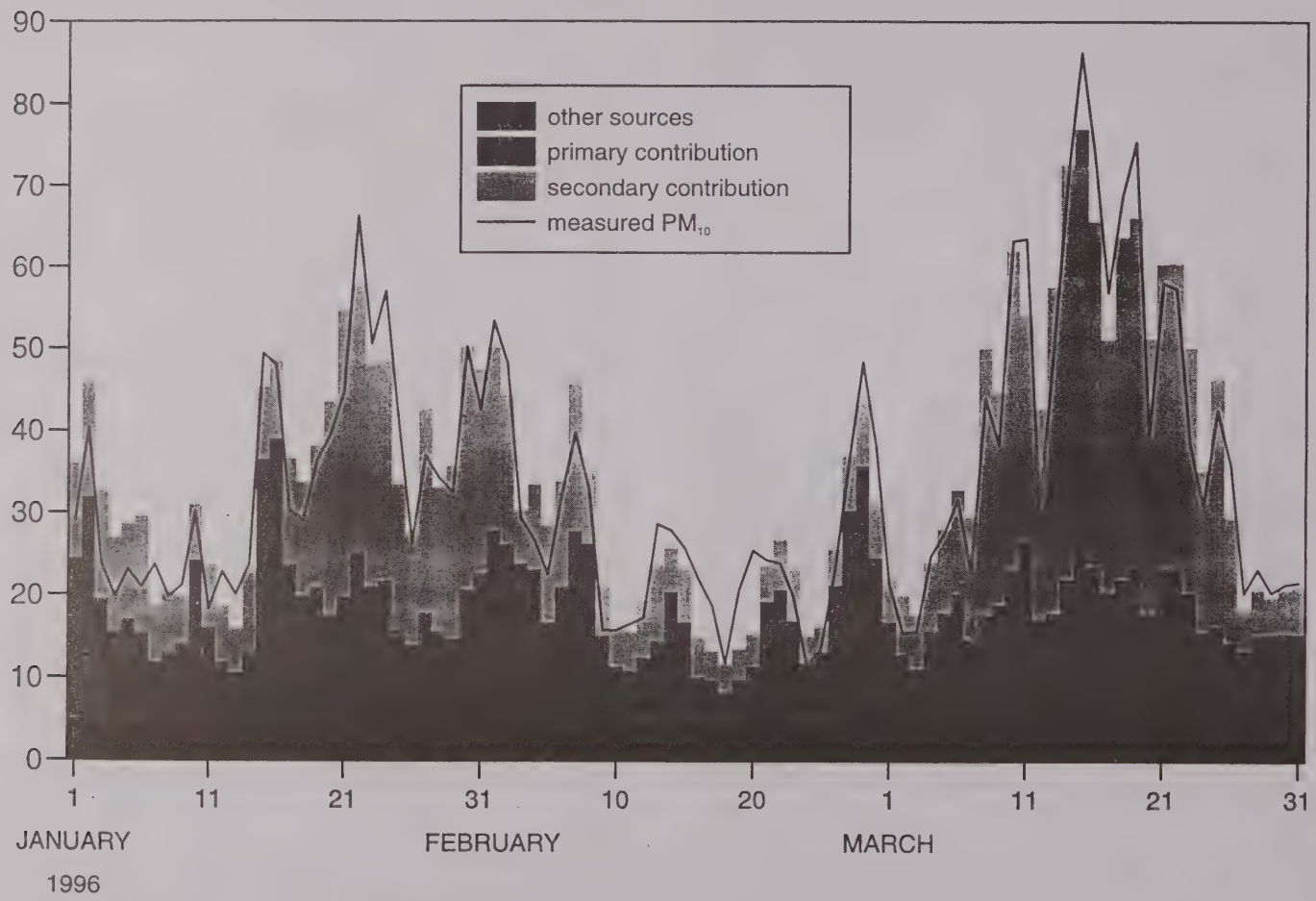
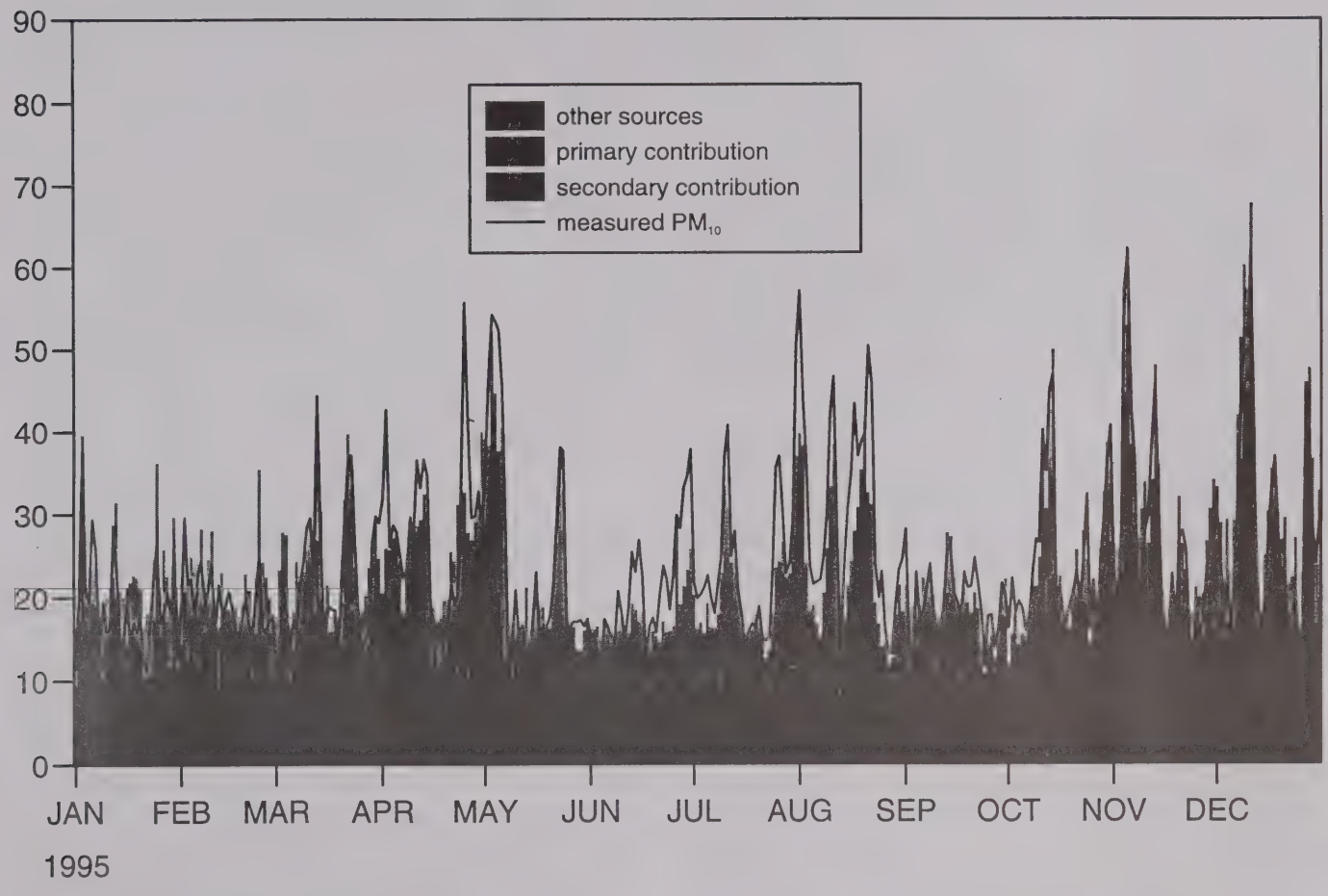


Figure 8: Network daily mean PM_{10} concentrations (μgm^{-3}), 1995



Suggested Techniques For A Second Stage Air Quality Review

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The recently published Guidance Note on the Review and Assessment of Air Quality suggests a three stage approach for local authorities undertaking this work. A critical review of this guidance suggests that the process could be regarded as complex and possibly beyond the current capabilities of local authorities.There is a perceived need to find ways of simplifying this process.This paper provides some approaches to assessing local air quality as part of a second stage review in a sufficiently detailed manner based on the type of information and resources currently available to local authorities.The methods described should enable most local authorities to determine areas that require third stage reviews without the need for detailed (and expensive) ambient monitoring and modelling studies.

Introduction

The Department of the Environment, Transport and the Regions (DETR) has recently published guidance which provides some details as to how local authorities are to carry out air quality reviews[1]. The guidance considers the review process in terms of three stages.

The first stage review may be little more than a desktop study which requires local authorities to identify significant sources, such as industry and main roads, and to review appropriate monitoring data.The guidance suggests that the results of the first stage review are presented on a base map of the local area. Identifying industrial sources is unlikely to represent an onerous task for local authorities. There is an opportunity here for a centralised database to be prepared which locates each industrial process and which guidance note it may be classified under. Such information could be readily published on the Internet, as Friends of the Earth have shown[2]. Main roads may simply be defined as motorways, trunk roads and 'A' roads. Most local authorities will have already identified main roads which may potentially impact upon local air quality. Indeed, many may already have some form of kerbside monitoring along main roads.

The guidance also provides some indication of the level of detail necessary to undertake a second or third stage review. The purpose of the second stage review is to provide an intermediate study to determine whether a more detailed review and assessment is required (i.e. a third stage review) in a particular location. The results of the third stage review, if required, will be used to determine the designation of an Air Quality Management Area.

The level of detail required for a second stage review is significantly more than for a first stage review and is similar to that required for a third stage review. It is uncertain whether local authorities will receive monetary assistance in second stage reviews and many may be discouraged from the exercise due to lack of resources or technical know-how. Although the latter of these issues is being addressed by the DETR working with the NSCA who are preparing a training programme, there is still the legal requirement and public duty for local authorities to proceed to a second stage review should the results of the first stage indicate that further assessment is required.

The suggested approaches to second stage reviews described in this paper, which are by no means exhaustive, are based on a working knowledge of resources available to local authorities with particular reference to the type of information readily available. These suggested approaches should enable local authorities to achieve the requirements of a second stage review (i.e. determine if a more detailed third stage review is required) without significant time and resource commitments.

Aims and Objectives of a Second Stage Review

The overall objective of a second stage review is to determine for which pollutants, and at which locations, there is a possibility that the relevant air quality objectives will not be achieved.

In the majority of cases, where further study is required, the results of a first stage review will identify (i) any large industrial operators who may be contributing to peak concentrations of sulphur dioxide, or (ii) any road traffic bottlenecks which may result in elevated concentrations of carbon monoxide and other traffic related pollutants. In the first case, the second stage review would include compiling emission data for the industrial process and using a screening model, such as ADMS-Screen, to quantify the contribution of the industrial plant to ground level concentrations of sulphur dioxide. If the results indicate that the air quality objective for this pollutant is being approached (i.e. within 75%) then a third stage review is required. In the second case, the results of available monitoring data may be used in conjunction with simple road modelling techniques to determine whether the relevant air quality objectives would be exceeded. Importantly in this second example, the results of the second stage review are likely to reduce the number of pollutants considered in a third stage review, if required.

The objective for a second stage review must be achieved using cost effective scientifically valid techniques. Moreover, as such reviews are likely to be funded by local authorities and are required to be completed within two years, the cost and timescale of such

a review must not be onerous.

The guidance indicates that the following information is required for a second stage review:

- details of any monitoring undertaken, including: pollutant species; concentrations and averaging times; estimation of accuracy and precision; gas or sampling systems; site details; quality control procedures; calibration gas traceability; and data processing techniques employed;
- details of any modelling activities: model results for current air quality and for the year 2005; model input data and any assumptions of emission characteristics; model accuracy, name of model used, details of model validation; and reference to DETR technical guidance;
- details of review and assessment methodology: reference to DETR guidance; estimated background concentrations; details of monitoring; and use of surrogate statistics.

The stated requirements for monitoring strongly suggest that only continuous monitoring equipment may be considered acceptable in many circumstances. Although many local authorities now have some form of continuous monitoring for a few pollutants at one or two locations, many more use only simple techniques, such as diffusion tubes, at several locations. The lead time for the installation of a continuous monitoring station is at least six months, assuming that funding is approved, which suggests that local authorities would need to act quickly in order to have sufficient data for the purposes of a second stage review within two years.

The requirements for modelling information are rather general and indicate that one of a whole range of modelling techniques may be used. The choice of model is dependent upon the level of accuracy required. Important to note is that the complexity of a model is not necessarily an indication of its accuracy. For the purposes of a second stage review, where only a screening assessment is required, simple techniques may prove to be the most cost effective.

The details of methodology indicated for a second stage review do not go beyond best scientific practice and serve as a useful checklist for local authorities in determining the quality of any assessment.

Overall, the guidance indicates that a detailed assessment is not required for a second stage review and, given the timescale for completing such a review, the installation of new continuous monitoring equipment may not be appropriate.

The Suggested Approach

The proposed means of achieving the objective of a second stage review is to consider the priority pollutants in terms of:

- road traffic pollutants
- nitrogen dioxide
- particulates
- sulphur dioxide.

With reference to the National Air Quality Strategy[3], this approach identifies only four priority pollutants to consider in assessing roadside air quality. These pollutants are: benzene; 1,3-butadiene; lead; and carbon monoxide. Concentrations of these pollutants are expected to be highest at roadside locations as road traffic represents by far the major source. There are exceptions to this, such as near to a petrol station forecourt or lead smelting works for example, but it is considered that local authorities will be aware of such local circumstances. Generally, if roadside levels of these four pollutants are within the proposed air quality standards then the general population should not be considered to be over exposed to these pollutants.

The situation for nitrogen dioxide and particulates (PM_{10}) is more complex. Although the dominant source of these two pollutants in urban areas is road traffic, the contribution from background and secondary sources is just as important. For this reason, these pollutants are assessed separately in this approach.

Sulphur dioxide is not considered a road traffic pollutant but is generally emitted from industrial and domestic sources. This pollutant is also considered separately in the approach detailed in this paper.

Roadside Air Quality

A first stage review requires identifying all motorways, dual carriageways and 'A' roads. However, part of the air quality review process requires publishing the results and seeking views from the local community and hence, such results may not be appropriate. A more considered approach would be to identify which roads have sufficient traffic to result in proposed air quality standards being exceeded at the roadside. It is suggested that many local authorities are likely, therefore, to undertake a second stage review of roadside air quality in their area to identify such roads. This type of approach was used by Kent County Council in reviewing its Transport Capital Programme in May 1997.

The contribution of road traffic emissions to local air quality can be estimated using a number of different dispersion modelling techniques. Each of these models requires some or all of the following information:

- traffic flow (e.g. number of vehicles per hour)
- type of vehicles (e.g. small cars, petrol cars with three way catalytic converters, HGVs, etc)
- mean vehicle speed (e.g. km/hr)
- location (e.g. urban or rural)
- distance from road to receptor
- local meteorological conditions (e.g. wind speed, wind direction and atmospheric stability).

Working closely with the Kent Highways Group it became apparent that significant effort would be required to compile the above data. However, information on traffic flows (vehicles per day), the proportion of heavy goods vehicles (HGVs) and average speed was available to varying degrees. Traffic flow data were available for all significant roads usually in terms of an annual average daytime flow. It was assumed that the peak hour flow was equivalent to 10% of the annual average daytime flow. The experience of the highway engineers was used to fill in the missing %HGV and vehicle speed data.

From this data gathering exercise it became apparent that traffic data, in terms of peak hour flow, %HGVs and vehicle speed, could be readily collated but that more detailed information, such as a break down of vehicle types, would require significant effort and additional traffic counts to a much greater detail than those currently undertaken.

With no other data available and with limited resources it was decided to use the Design Manual for Roads and Bridges screening assessment method[4]. However, to simplify the assessment only urban roadside air quality was assessed. This was defined as a location 10 m from the road centerline. This distance will not be applicable for all types of road but should be sufficient to identify roads with traffic flows which may lead to an exceedance of the air quality standards.

The results of adopting the DMRB method for assessing 1995 roadside air quality in terms of benzene, 1,3-butadiene, lead and carbon monoxide are presented in Figure 1. It should be noted that estimates of background concentrations in urban areas have been included. The range of values between each pair of lines represents the range of %HGVs considered (0-15%). The results indicate that for urban roads, with a mean vehicle speed of less than 40 km/hr, the air quality standards for all four pollutants may be currently exceeded if the peak hour flow is greater than 3,000 vehicles (equivalent to 30,000 annual average daytime flow). Importantly, the proportion of HGVs does not seem to be a significant factor for these pollutants for the purposes of this assessment.

From Figure 1 it may be deduced that, for the assessment of current air quality, the critical road traffic pollutant is 1,3 butadiene. Unfortunately, the technique for monitoring this pollutant is expensive. However, many local authorities use diffusion tubes to monitor benzene concentrations at roadside and urban background locations. From national emission data provided in the National Air Quality Strategy, benzene emissions and hence, roadside concentrations, can be assumed to be three times greater than 1,3-butadiene. This is confirmed to some extent by a regression analysis of monitoring data obtained from the continuous monitoring station at University College London[5], Figure 2. The results of this analysis suggest the following relationship between ambient concentrations of benzene and 1,3 butadiene:

1,3 butadiene = 0.172 * benzene + 0.063 (in parts per billion)

On the basis of national emissions and monitoring data, if monitored values of benzene are less than 3-5 ppb then the air quality standard for 1,3-butadiene would not be exceeded. Although recent studies in South Wales[6] indicate that monitoring of benzene by diffusion tubes provides an underestimate of the true concentration, this technique is considered valid for the purposes of a second stage air quality review.

A similar means of assessment may be used to determine exceedance of air quality objectives for road traffic pollutants in the year 2005. The forecasts in vehicle emissions are currently being revised by the DETR. An update to this assessment methodology is therefore required on completion of this review.

The conclusion to this analysis is that in areas where road traffic is the dominant source of benzene, 1,3-butadiene, lead and carbon monoxide, the proposed air quality standards for each will currently be met if benzene levels are below 3-5 ppb. Such data can be obtained from diffusion tubes. The recent addition of a number of kerbside monitoring stations to the national network (see Table 1) will enable this preliminary work to be verified towards the end of 1998 when ratified data for a period including both summer and winter are available from a number of stations. The assessment of compliance with the air quality objectives for 2005 AD cannot be undertaken until the revised vehicle emission factors are published. However, a worst case assumption can be made that vehicle emissions will not reduce significantly over the next seven years. If, on the basis of this assumption, the results of a second stage air quality review indicate that relevant air quality objectives would not be exceeded then no further study is required.

Nitrogen Dioxide

The assessment of nitrogen dioxide for a second stage review is probably best restricted to a review of appropriate monitoring data. Ground level concentrations of nitrogen dioxide are not directly related to emissions and, as there is no one dominant source, emissions are neither readily identifiable nor quantifiable. This is demonstrated in Figure 3 - a scatterplot of annual mean concentrations of nitrogen dioxide and traffic flows at locations in London and Kent where kerbside monitoring is undertaken. Fortunately, many local authorities use diffusion tubes to measure nitrogen dioxide at roadside, urban background and other categories of location.

This technique for monitoring provides a good measure of the annual mean concentration of nitrogen dioxide for comparison with the proposed air quality standard of 21

ppb. Moreover, the ease and low cost of this technique (supply and analysis of diffusion tubes for one site is approximately £150-200 per annum) has contributed significantly to its widespread use in the UK.

The principal air quality standard proposed for nitrogen dioxide is 150 ppb expressed as a maximum 1-hour mean. Monitoring to determine compliance to this standard requires the use of a continuous monitoring station which is both expensive, in terms of capital and revenue, and labour intensive. Assuming that the analyser lasts ten years, the annual cost of one continuous NOx analyser is approximately equivalent to twenty diffusion tubes monitoring sites. This suggests that the most cost effective form of monitoring would be by diffusion tube. The recently published guidance on monitoring[7] suggests that both techniques measure to within +/-30%. Concurrent monitoring of nitrogen dioxide using both techniques by Ribble Valley Borough Council[6] produced results within this margin of error.

Discussions with various environmental health officers suggest that the public are far more likely to find monitoring applicable to them if it is undertaken near to where they live and work. This suggests that twenty diffusion tube sites will achieve far more, in terms of public understanding, than one continuous monitoring station serving the whole community. This is an important concept when local authorities start developing Air Quality Plans and try to involve the public in solving the problem.

Due to the multitude of factors that can give rise to short term extreme concentrations of air pollutants (meteorology, pollution, control equipment failure, traffic accidents) there is no direct relationship expected between the annual mean and maximum 1-hour concentration of nitrogen dioxide. However, as the annual mean decreases, the frequency of short term peaks exceeding the threshold reduces. This is illustrated by Figure 4 which plots the annual mean of nitrogen dioxide observed at each continuous monitoring station for each available year (1979 - 1996) against the number of hours the 150 ppb standard was exceeded. All data were extracted from the National Air Quality Information Archive[5]. As expected, the number of hourly exceedances increases with the annual mean although there is no direct relationship between the two variables.

Importantly, the results indicate that if the annual mean is less than 20 ppb then the chances of the proposed short term air quality standard being exceeded are very low.

For local authorities wishing to continue along the route of modelling, the above analysis could prove extremely useful as more conventional assessment techniques would require considerable time and resources. For example, the following stages are required to properly model a maximum or 99.9th percentile of hourly values:

- construction of a detailed emissions inventory providing hour by hour emissions from all significant sources (road traffic, industry, commercial and residential properties);
- purchase of an hour by hour meteorological data (so as to match up with changes in emissions - a statistical meteorological data file will not be sufficient);
- purchase or commissioning of a new generation model, such as UK-ADMS Urban, to estimate the short term peak concentrations.

Annual average emissions, such as those reported for the West Midlands[8], would not be sufficient for this type of assessment. The limitations of advanced models imposed by the availability and detail of emissions data are highlighted in the draft guidance on modelling[9]. This is important as the level of effort required to construct an emissions inventory is increased dramatically when seasonal, diurnal and hourly variations are taken into account. Meteorological data are available from the UK Met Office but only for a limited number of sites in the UK. Lastly, experience with new generation models, such as UK-ADMS, suggests that model runs take several days to run. Sensitivity studies, when models are run repeatedly with minor changes in parameters, may be limited which will, in turn, limit the quality control of such modelling studies.

A more cost effective and practicable technique would be to model annual, or perhaps seasonal, average concentrations and use Figure 4 to estimate the probability of the proposed short term standard being exceeded. This method of assessment may not be as mathematically correct as a detailed modelling approach but the results are likely to be the same and, in terms of policy development, just as useful.

The conclusion to the assessment of nitrogen dioxide is that monitoring data is probably the best technique for both first or second stage reviews as no account need be taken of the contribution from each source nor of atmospheric chemistry. However, for local authorities using modelling techniques, the level of detail indicated in the DETR guidance may not be necessary. The results of using diffusion tubes or modelling would provide a good indication of the likely number of exceedances of the proposed 1-hour air quality standard without the need for costly monitoring or modelling studies.

Particulates (PM_{10})

The air quality objective for PM_{10} detailed in the National Air Quality Strategy is based on the recommendation made by the Expert Panel on Air Quality Standards (EPAQS) for a rolling 24-hour mean guideline of 50 $\mu g/m^3$,[10]. However, the EPAQS suggests that the most effective means of minimising the number of exceedances of this short term guideline will be to progressively lower annual average

levels. This is illustrated in Figure 5[11].

Similar to nitrogen dioxide, urban levels of PM_{10} are a result of vehicle emissions, background sources and atmospheric chemistry. Typical urban background levels of PM_{10} in 1995 were in the range 20-28 $\mu g/m^3$ expressed as an annual mean[5]. The Quality of Urban Air Review Group (QUARG) has reported preliminary research which suggests that approximately 10 $\mu g/m^3$ of this level is made up of secondary particles[12]. These preliminary findings are confirmed, to some extent, by the recent work undertaken by David Muir at Bristol City Council[6]. Seasonal variations in PM_{10} are observed with the additional effects of meteorology also being important. Exceedances of the air quality standard for PM_{10}, expressed as a rolling 24-hour mean, are observed in summer months which may be wholly due to photochemical processes but, conversely, during winter months may be due to temperature inversions trapping emissions at ground level. However, recent evidence suggests that most urban PM_{10} does not originate from local sources and that the occurrence of exceedance episodes tend to occur across whole regions of the country[13].

The most realistic approach to monitoring levels of PM_{10} in urban areas is likely to occur initially as a result of managing other pollutants such as nitrogen dioxide by reducing road traffic levels. QUARG has reported a reasonable relationship between monitored concentrations of PM_{10} and nitrogen oxides which suggests that, for local authorities, monitoring of nitrogen oxides (as opposed to nitrogen dioxide) alone would be sufficient to monitor reductions in PM_{10} levels by reducing road traffic levels. Unfortunately, recent work by Birmingham City Council indicates that local controls on PM_{10} emissions may have little effect on air quality[14].

The conclusion to reviewing particles is that local authorities may have no choice but to initiate expensive monitoring studies. Unfortunately, a variety of studies have indicated that the use of smoke monitoring data cannot be used as a surrogate for PM_{10} although some correlation could be expected at kerbside locations[6]. Local authorities should bear in mind the episodic nature of elevated concentrations of particulates which can occur across large parts of the UK. Any local monitoring data should be interpreted with close reference to data available from the National Air Quality Archive.

Sulphur Dioxide

The EPAQS has published a guideline of 100 ppb for sulphur dioxide measured as a fifteen minute mean[15]. This guideline, which is adopted in the UK National Air Quality Strategy, is based on the acute health effects of the pollutant. EPAQS suggests that there is insufficient evidence to recommend a standard based on a longer averaging period. Only the use of continuous monitoring equipment will enable local authorities to measure compliance with this guideline. Before committing themselves to this level of expenditure, local authorities need to consider the options available to them.

The nature of sulphur dioxide emissions has changed over the last thirty years. The reduction in the use of domestic coal, since the *Clean Air Act 1956*, has more or less eliminated the occurrence of extended periods of high sulphur dioxide and smoke concentrations in urban areas. Moreover, industrial use of coal has also decreased with many operators using electricity generated by coal or gas fired power stations located in more rural locations. The use of oil fired boilers by small industry (cited in the national Air Quality Strategy as being a source of elevated concentrations of sulphur dioxide in urban areas) is in decline as consumers switch to gas[16]. Today the pattern of sulphur dioxide is characterised by low annual average concentrations in urban areas with short term peak concentrations due to the grounding of plumes from large industrial sources.

The majority of local authorities have historical or even ongoing records of sulphur dioxide and smoke monitoring based on daily averages. For urban areas where coal is still burnt, EPAQS suggests that the 100 ppb guideline is unlikely to be exceeded if either the maximum daily mean concentration of sulphur dioxide is below 28 ppb or if 98% of the daily means are below 19 ppb. Table 2 summarises monitoring data from the smoke and sulphur dioxide monitoring network for 1995 and 1996. The results suggest that most urban locations are likely to experience short term exceedances. A review of the exceedances reported from national monitoring sites confirms this observation[17].

For most local authorities without continuous monitoring equipment, the extent of their review for sulphur dioxide will consist of reviewing historical data with respect to the surrogate statistics suggested by EPAQS and identifying any large industrial operators, such as power stations, within a distance of approximately ten kilometres. Monitoring data from the smoke and sulphur dioxide monitoring network for 1995[5] suggest that most urban locations are likely to experience short term exceedances. However, as any exceedances, or potential sources of exceedances, are most likely to be associated with large industrial operators, the responsibility for the assessment and future management of such sources lies with the Environment Agency and not the local authority.

Conclusions

The level of detail required for a second stage review, as described in the draft guidance on air quality reviews, does not appear to be so onerous as to discourage local authorities from undertaking such reviews although there is a need to provide training to ensure a consistent approach to assessments. The author hopes that the methods detailed

in this paper may prove a useful starting point for local authorities in fulfilling the objective of a second stage review - to determine whether a third stage review is required - using information likely to be available and without the need for detailed assessment studies. However, further techniques are required as the methods described in this paper will not apply to all situations.

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Table 1: Kerbside Monitoring Sites in the UK National Network

Station	Location	Year Commenced	Pollutants Monitored	Dist from Kerbside	AADTF
Marylebone Road	Central London	17 Jul 97	NOx, CO, PM_{10}, O_3, SO_2, benzene, 1,3 but.	1 m	50, 000
UCL	Central London	11 Feb 93	Benzene, 1,3 butadiene	2 m (?)	not stated
Tweedy Road	Bromley	2 May 97	NOx, CO	2 m (?)	not stated
Swiss Cottage	Camden	16 May 96	NOx, PM_{10}	2 m (?)	50, 000 (+)
Tottenham High Road	Haringey	16 May 96	NOx, PM_{10}	2 m (?)	39, 000
A4 and M4	Hounslow	16 Sept 96	NOx, CO	8 m	155, 000
A3	Kingston	20 March 97	NOx, CO, PM_{10}	2.5 m	not stated
Old Kent Road	Southwark	1 Apr 97	NOx, CO, SO_2	2 m (?)	50, 000
St Nicholas Way	Sutton	1 April 96	NOx, CO, PM_{10}, SO_2	3.5 m	20, 000
Mile End Road	Tower Hamlets	1 April 96	NOx, CO	2 m (?)	not stated
Hope Street	Glasgow	10 March 97	NOx, CO, PM_{10}	20 m	120,000
Broadgate	Lincoln Centre	6 May 97	NOx	2 m	not stated
M62	Bury	20 Jan 97	NOx, CO, PM_{10}, O_3, SO_2	30 m	40,000
St Aldate's	Oxford Centre	15 April 96	NOx, CO, SO_2	3 m	200,000
London Road	Bath	18 Nov 96	NOx, CO	2 m (?)	not stated
Old Market	Bristol	1 July 96	NOx, CO	2 m (?)	22, 000
Queen's Street	Exeter	2 July 96	NOx, CO, O_3, SO_2	3 m	30, 000
Church Road	Hove	16 Sept 97	NOx, CO	3 m	10, 000
Guildhall	Norwich	21 Jun 97	NOx	2 m (?)	10, 000

AADTF - Annual Average Daytime Traffic Flow

Table 2: Results From The UK Smoke and Sulphur Dioxide Monitoring Data

Location	1995			1996		
	Arithmetic mean	98th %ile Daily means	Maximum value	Arithmetic mean	98th %ile Daily means	Maximum value
Southeast England						
Bedford	3.37	10.12	13.12	3.37	8.62	15.75
Crawley	8.25	25.12	**31.87**	6	13.87	25.5
Dartford	7.5	40.12	**58.87**	5.25	**24**	28.87
Eastbourne	6	18.75	24	5.25	10.5	12.75
Maidstone	12.37	20.62	**28.5**	7.87	13.87	21
Milton Keynes	7.5	18.37	27.75	8.25	**19.87**	23.25
Newbury	4.12	7.5	9.75	3.75	7.12	7.5
Portsmouth	4.12	7.87	13.12	6.37	16.5	21.75
Runnymede	8.62	19.87	27.37	6.37	16.5	20.25
Slough	7.5	13.87	18.37	6.37	11.25	15.37
South Oxfordshire	4.87	11.62	13.5	4.87	10.87	15.75
South Oxfordshire	5.62	12	15.37	5.25	12	14.25
St Albans	8.62	21.75	24	5.25	10.12	12
Thurrock	12.37	42	**58.12**	7.12	**21.75**	49.12
Thurrock	10.87	23.62	**33.75**	9	**22.12**	58.5
Vale of White Horse	4.5	9.37	13.87	4.5	9.37	16.12
West Midlands						
Cannock Chase	6.37	18.37	25.87	7.12	**22.87**	43.12
Cannock Chase	12.75	30.75	**49.12**	3.12	**32.25**	47.62
Dudley	8.25	14.25	**33.37**	9.75	**20.62**	45.75
East Staffordshire	7.5	22.5	**36**	7.5	**41.25**	85.12
Sandwell	6.75	16.12	20.25	12	**27**	39.75
Sandwell	6.75	16.12	20.25	12	**27**	39.75
Stoke-On-Trent	15.75	34.12	**40.5**	15	**30.75**	56.62
Walsall	5.62	17.62	**55.5**	6.37	**24.37**	58.5
Wolverhampton	7.5	16.12	22.87	8.25	**25.5**	47.62
Northeast England						
Blackpool	5.62	12.37	19.12	5.62	16.5	28.5
Bolton	7.12	18	27.37	9.37	**27.75**	40.5
Bolton	9	19.12	24.75	9.37	**25.5**	46.87
Bolton	7.12	19.5	24.37	7.12	**24.37**	41.25
Burnley	3.75	7.5	14.62	6.37	**21**	25.5
Bury	13.5	20.25	25.12	16.12	**36.37**	44.25
Chorley	7.12	19.12	20.25	11.62	**26.25**	41.25
Crewe and Nantwich	0	0	0	11.62	**35.25**	43.87
Crewe and Nantwich	8.25	18.37	22.5	12.75	**31.12**	33.75
Ellesmere Port	7.5	20.62	**36**	7.87	**41.25**	80.62
Halton	7.87	17.62	22.5	6	13.12	20.62
Hyndburn	14.62	24.37	**46.5**	16.87	**28.12**	33.37
Liverpool	9.37	30	**61.5**	16.12	**38.62**	56.25
Macclesfield	8.25	16.87	19.12	10.5	**20.62**	25.12
Manchester	6.37	14.62	19.12	10.5	**16.87**	36
Manchester	6	15.75	18	10.12	**23.25**	40.87
Manchester	5.62	11.62	18.75	9.75	**22.87**	46.12
Oldham	15.37	35.62	45.37	6.75	**23.25**	30.37
Rochdale	12	20.62	**98.25**	12	**20.25**	22.87
Rochdale	12	20.62	**98.25**	12	**20.25**	22.87
Rossendale	4.12	7.5	7.87	5.25	12.75	40.5
Rossendale	5.62	10.87	18	5.62	13.87	23.62
Salford	6	13.87	16.12	6	18.75	35.62
Sefton	13.5	30.75	33	16.87	**37.12**	40.5
Sefton	13.87	33.75	**35.62**	13.5	**31.5**	34.12
Sefton	11.62	0	33	15	**36**	37.5
St Helens	7.87	16.12	21	14.25	**29.75**	41.25
St Helens	7.12	19.87	**33.37**	9.75	**25.5**	35.62

Values in bold indicate exceedances of the AQS for SO_2 expected, based on EQAQS recommendations

Figure 1: Maximum Peak Hour Flows to Maintain Roadside Levels of Road Traffic Pollutant Levels below Proposed Standards in 1995

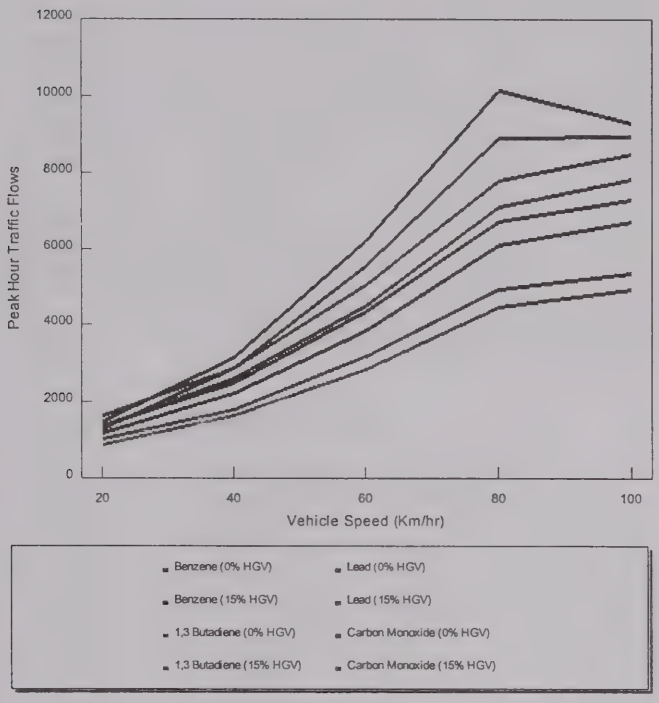


Figure 2: Scatterplot of Benzene and 1,3 Butadiene (Data from UCL 1994-1996)

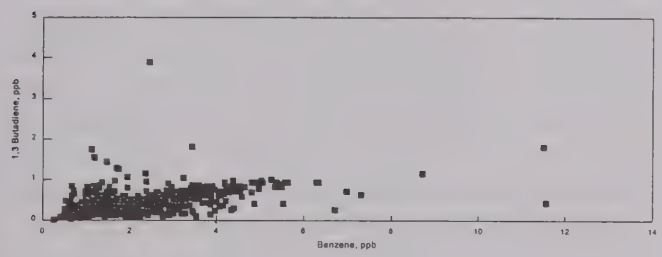


Figure 3: Scatterplot of Annual Average Daytime Flow and Annual Mean Roadside Levels of Nitrogen Dioxide

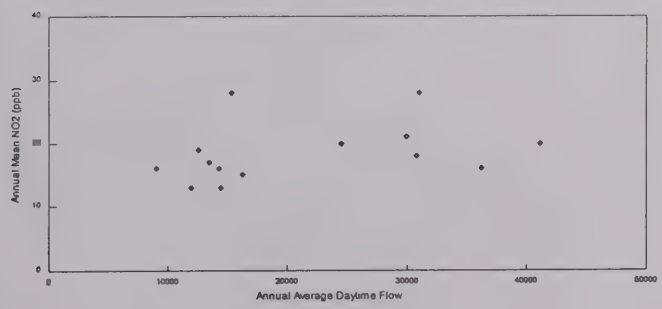


Figure 4: Exceedances of the EPAQS 1-hour Guideline for Nitrogen Dioxide Against the Annual Mean

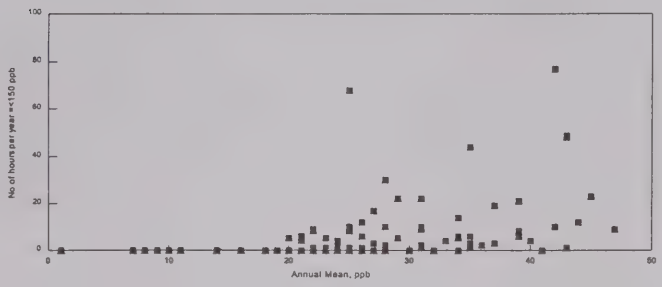
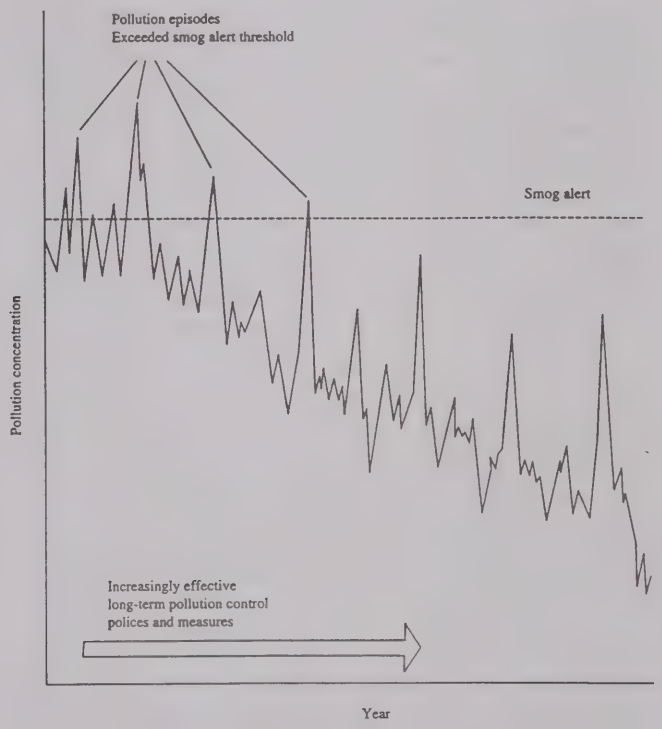


Figure 5: Reducing baseline emissions over several years will eventually reduce the frequency of occasions when smog alert levels are exceeded, although variability in weather conditions from year to year may obscure this trend for a while



Source: Elsom, D (1996). Smog Alert. Managing Urban Air Quality, p. 108. Earthscan Publications Limited

Modelling of Air Pollution - Its Use and Limitations

R S Scorer
Imperial College, London

The article offers a different perspective on modelling for air pollutants and has been written in response to Dr. Middleton's article, Discourse on Air Quality Modelling, carried in Clean Air, No. 6, 1997.

Origins

Modelling is as old as applied mathematics. The ancient Greeks used it to estimate the size of the Earth. It required the assumptions that the Earth is spherical and that light, which determined the position of shadows, was beamed along straight lines. They also assumed that the proportions of the model had the same angles as the real thing so that they didn't have to make more than one actual measurement on it and the rest could be deduced from a rough diagram on parchment or stone, or even by marks on the sand, and that the sun's distance was very large compared with the size of the Earth.

Laws of Nature: Cause and Effect

Newton set modelling going in earnest by discovering that the hypothesis of the inverse square law of the force of gravity, a predictive formula, could be found for the paths of the planets in space. His model was a picture of the solar system, and the fact that the theory of gravitation was validated by observations was taken to mean that he really had discovered the natural law; and although he nor anyone else had a model of how the force of gravity worked and was propagated through empty space - a deficiency for which philosophers criticised him - that wasn't a real problem because it was merely asserted that the connection described by the mathematical formula was a natural law ordained by God. Such an explanation was accepted by Sir James Jeans in the 1920s as evidence that God was, like himself, a mathematician. And as a result of Newton's discovery it has been assumed that all the movements and changes that ever occur are "governed" by the "laws of nature". The existence of this governance has given rise to a belief that the laws can always be expressed mathematically because they refer to inanimate material. Also, the existence of the laws implies a very direct relationship between cause and effect. Thus everything that happens can, presumably, be explained and expressed by differential equations.

During the nineteenth century a wonderful time was had by designers of machinery of all kinds in making things happen in the intended fashion by means of the appropriate gadgets. Steam power and the plentifulness of fossil fuel produced the requirement for computing machines, and led to Richardson's dream that the future weather could be forecast by solving the relevant differential equations. Also numerical methods became necessary as soon as the equations were found to be non-linear, and therefore generally insoluble, by the very powerful methods of approximation using convergent infinite series, each term of which was a solution.

Natural Chaos: Richardson's Dream Blurred

We now appreciate that complex situations do not have unique solutions, but after a short time "become chaotic", meaning that individual cases may quickly display great differences from each other, even when the starting conditions are very nearly the same and differ only within the accuracy of the measurements or statements of the initial data. Anyway chaos arises because of the approximations which have to be made in using the numerical methods of calculation. Thus forecasts become unreliable in detail within two or three days.

The relevance of this to forecasts made by numerical methods is obvious, and there is a very severe limit to the time into the future that forecasts can still be useful. When attempting to predict the dispersion of air pollution we require first a forecast of the wind structure and several other parameters of the weather and then compute pollution concentration according to several further dubious assumptions about the mechanism of dispersion. This makes the prediction of the concentration of the pollution orders of magnitude more difficult and unreliable than the prediction of the air motion which, at this stage, may contain none of the types of motion which will actually cause the dispersion on the occasion of interest.

Modelling Dispersion and Identifying Pollution Sources

The procedure of pushing pollution up a chimney and out into the air is centuries old but has become dangerous because, even when each plume seems to be carried away and diluted until it becomes harmless, the sum total of everyone's plume may be highly objectionable.

It is not correct to say that modelling enables us to specify the whereabouts of the effluents of each source - the idea being to find out which source was responsible for each particular bit of pollution. It is recognised that the representation of the dispersion mechanism is so crude that the only way to make such discriminations is by putting different material pollution tracers into each source and hope to be able to detect them individually a long way

downstream. Thus, when black smoke was found in snow falling in eastern Scotland, it was first of all attributed to almost any known large source in Britain on the calculated trajectory of the air to the site of the polluted snow. But when it was shown that the East Midlands power stations in England could not have emitted such black smoke because their combustion was always too efficient, it became possible to blame some other source. With inspiration from meteorologists in West Berlin who had long experience in tracking various episodic pollution back to their sources further east, it became easier to believe that the black smoke in Scotland had come from Slovakia or Hungary. Such a thesis was made convincing by the tracking of the radioactive debris from the nuclear explosion at Chernobyl in April/May 1986.

Computing the Concentration

The deposition of radioactive iodine and caesium in Western Europe followed a very convoluted track described by the author in *The Spread of Nuclear Pollution from Chernobyl*[1]. There was a changing weather situation and although the pollution had become much diluted, much of it remained in a thin layer just below cloud base and was scarcely detected by the measurements at or close to the ground. It was deposited in a more concentrated form under rain showers which had concentrated it in the rain from air which had been drawn horizontally into the shower and been deposited in dangerous concentrations where the rain fell, while there was no deposition in between the wetted areas. A great deal was learnt by the study of that situation because the pollution was so easily identified. The soot in the black snow was subsequently found to have been transported across Germany and the Low Countries, and then across the North Sea before being deposited in East Scotland[2].

It is very relevant to this discussion that most models are subjected to a so-called validation in cases where the details of the meteorological situation have been known so that they can be fitted roughly to the pollution actually measured. Even then the agreement is not considered bad if it is within a multiplying or dividing factor of 2 or 3. The knowledge of the vertical velocity of the air carrying the pollution is easy neither to predict nor to measure, so that much of the parameterising of the nature of the details of the air motion are only roughly and somewhat arbitrarily guessed.

Whiffs: Choosing the Target for Abatement

Any picture of a plume of pollution demonstrates that the concentration shows great variations along its length. The concentration experienced at any chosen point on the ground varies as the plume wanders from side to side, so that occasionally the point experiences whiffs of high concentration whose frequency and magnitude vary as the point moves away from the source. Various formulas for the ratio of the whiff concentration maximum to the long term average (specified as ten minutes, one hour, one day or one month etc) have been proposed by people who (think they may) have sufficient observational experience to make a useful guess. They make one suspect that the prediction that a forecast will come within a factor of 2 or 3 of what is subsequently observed (which has been suggested above) is an expression of optimism rather than realism.

In making use of such predictive information we have to have some idea as to the sensitivity of the victim to be polluted. Is it a hospital patient, a very young or very old person, a sufferer from emphysema, a person working in a dangerous place (such as a power line worker, steeplejack etc), or could the pollution be dangerous only cumulatively like asbestos dust? Is a healthy victim always assumed to be able to overcome adverse effects?

To use the model technique to good purpose, a public health officer must know about the potential victims in the locality, and may have to make several visits to confirm expectations. Studies of effects using the model can reveal only the properties of the model - not the real thing. To make any model several parameters have to be invented; however they will restrict the range of possible outcomes, and one might as well use a simple model of the whole process based on experience instead of on the mean fluid mechanics of the air, as described in various papers by the author[3,4].

Ultimately some sort of cost-benefit analysis has to be made if the abatement of pollution and the maintenance of air quality standards is to be achieved at some public expense. With that in mind the costing was analysed by the author[3], where instead of parameterising the dispersion mechanisms, the differences between the different kinds of source were guestimated. There was reluctance to follow that line because judgement was required, based on observational experience, and there was no ready precedence to exploit. Nevertheless the only quantitive criticism received was from Dr. D.H. Lucas (see ref. 4i - working party members) to the effect that the dilution of effluent from power station chimneys was underestimated by a factor of around 4.

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(These references refer to chapters in books and original papers by R.S. Scorer)

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First Phase Authorities
North East Derbyshire

Phil Woodward
Chesterfield Borough Council

The North Eastern Derbyshire Air Quality Management Group was established in 1993, involving Chesterfield Borough Council, Bolsover District Council, North East Derbyshire District Council, the Environment Agency (then HMIP) and North Derbyshire Health Authority.

The Group had identified the pollutants of primary concern prior to the publication of the Environment Act. When details emerged of the first-phase process, the Group submitted a bid to participate. The DOE (now DETR) approved its participation on the bases of carrying out a project to investigate PM_{10} pollution in the area.

This report should have been included in the last issue of Clean Air (March/April 1998), which focussed on the work of the first-phase authorities.

Introduction

The project had two aims:

- to quantify PM_{10} concentrations in a 5 km^2 area of the north east of Derbyshire containing opencast coalmines, a solid fuel processing plant and the M1 motorway corridor;
- to characterise the PM_{10} deposits.

The project brief specified that:

- monitoring for PM_{10} in ambient air should be carried out at six locations using low volume gravimetric samplers;
- the sampling period was to run from midnight to midnight on alternate days;
- protocols for the conditioning and handling of filters was to be agreed with suppliers (NAMAS accreditation sought);
- Met. Data (to Met. Office standards) was to be collected during all sampling periods;
- likely sources of collected particles were to be identified by such techniques as x-ray diffraction and scanning electron microscopy.

The Partisol 2000 air monitor was selected for the project because of its robust cabinet design, its price, the fact that it is mains powered and the availability of hub/satellite units (allowing a reduction in personnel costs).

The six monitoring locations were selected to have a general west - east orientation in the following sequence:

• monitor (urban background) • monitor (close to opencast site) • **opencast site** • monitor (close to opencast) • **M1 corridor** • monitor (close to M1 • **fuel processing plant** • monitor (close to fpp) • monitor (urban housing)

Monitoring began early in November 1996 and was concluded in October 1997. Servicing of the equipment was undertaken by staff of all three participating authorities.

Results

1. Quantification

- Over 800 individual gravimetric results were obtained from the six sites;
- over 100 (15%) of the individual results exceeded the EPAQS recommended standard (now adopted as the Air Quality Standard);
- the overall average of the six sites during the monitoring period was 26 $\mu g/m^3$ (range = 18 - 29);
- the maximum validated concentration recorded was 178 $\mu g/m^3$;
- when the EPAQS recommendation was exceeded, it was exceeded at most of the sites.

Comparisons of the average daily concentrations at the sites were made with data for the same monitoring periods from the EUN site at Sheffield City. A graph comparing these concentrations indicates very similar trends in peaks and troughs for the majority of the monitoring period.

2. Characterisation

A number of attempts have been made to characterise the collected PM_{10} deposits in order to determine any temporal or locational differences. The methods used in this process have been qualitative rather than quantitative.

Scanning electron microscopy

This method is best carried out using flat membrane filters such as PTFE or cellulose nitrate rather than glass fibre. The results were found to be of most use in identifying inorganic elements within the particulate although a significant proportion of the deposit was noted to be of organic origin.

X-ray diffraction and fluorescence

The laboratory undertaking this work concluded that "the analysis has not shown any distinguishable characteristics between any of the filters".

Based on our experience of SEM and XRD/F, we sought a technique which would give us further insight to the (substantial) organic component of the deposit on the filters.

POPP analysis (Pyrolysis of Organic Polymer on Particulate)

In this novel technique a portion of the filter is pyrolysed in order to release adsorbed and bound organic compounds from the particulate. The organic species released are then analysed using GCMS to identify chemicals involved in the particulate formation or subsequent exposure.

Comparisons of the GCMS traces produced by POPP with library reference traces of known organics were used to identify the primary organic components of the particulates. The range of organics identified included: alkanes; benzene; alkyl benzene; phenols; naphthalene; fluoranthene; pyrene; benzpyrene; anthracene.

Conclusions and Observations

- Using this monitoring method, 15% of the samples collected were greater than the EPAQS recommendation.
- the data show a breach of the *Air Quality Regulations 1997*;
- the trends (peaks and troughs) in concentrations of PM_{10} measured in the north east of Derbyshire tend to follow those seen at the EUN site in Sheffield;
- a standard filter type and method of conditioning/handling should be agreed if the Partisol is to be used to assess PM_{10} concentrations against the EPAQS recommendation;
- the relationship between the TEOM and Partisol (and other methods) needs to be fully established. (Assuming that the performance of the TEOM is also fully validated.)
- filter selection has a critical bearing on subsequent characterisation techniques;
- the SEM characterisation work suggests a relatively consistent composition to the PM_{10} in the area on the same monitoring days. It further suggests significant temporal differences in the composition;
- the organic characterisation work suggests significant variations in the proportions of the various organic species identified at adjacent monitoring sites on the same day;
- more investigation is required of particulate composition if sources are to be accurately identified and control measures implemented.

Constraints

- First phase funding did not allow completion of the desired degree of characterisation;
- time constraints did not allow for an analysis of PM_{10} concentrations by wind direction or wind speed;
- our experience identified difficulties in acquiring 24 hr samples for comprehensive inorganic/organic analysis making source identification unreliable.

Further Information

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UPDATE

SUSTAINABLE DEVELOPMENT

According to a MORI poll for the DETR, 88% of people are concerned about the environment; the highest concern is shown for pollution issues, in particular, water pollution and dangerous wastes, and there is rising concern for air quality and traffic issues.

Government proposals in a number of areas already aim to promote sustainable development, which is based on four central aims:

- social progress which recognises everybody's needs;
- effective protection of the environment;
- prudent use of natural resources; and
- the maintenance of high and stable levels of growth and employment.

The Government is now asking people to tell it how we can all help to make Britain greener - and richer - for future generations. Copies of a consultation leaflet, *Options for Change,* launched in February are to be made available in public libraries etc for people to fill in and return to the DETR.

REVIEW OF AQ STRATEGY

Proposals for amending the National Air Quality Strategy are due to be published by the end of 1998. The review will consider new scientific, economic and technical evidence, such as that on the health effects of air pollution. The review will also look at a number of policy measures to reduce air pollution ensuring, though, that any proposed action does not place a disproportionate burden on any sector of society. Work on the Government's integrated transport policy and forthcoming EU legislation are also likely to have a major effect on the review's findings.

LAPC CHARGES 1998/99

Increases in some of the charges applicable to Part B processes in England and Wales authorised under Part I of the EPA took effect on 1 April.

An application for an authorisation increases £25 to £1,065 and the annual subsistence charge is up £20 to £660 (£685 if paid in instalments); an application for a variation rises to £680 (up £15), except where the variation is to upgrade an existing process in accordance with Guidance issued by the Secretary of State. Fees for small waste oil burners and service stations are not increased.

THE COST OF AIR POLLUTION

A report* from the British Lung Foundation released in early February values the suffering, illness and premature death attributed to road traffic related pollution at over £11 billion a year. The report quantifies the impact of air pollution on quality of life - i.e. the effect pollution related illnesses, such as asthma and bronchitis, have on an individual's ability to perform at work, go outside, go to school, exercise etc.

The BLF study, funded by BG plc, and undertaken by Professor David Pearce at the Centre for Social and Economic Research on the Global Environment has calculated the health costs of pollution by multiplying the number of pollution related deaths and illness events that occur every year by the price people are willing to pay to avoid the risks of these happening.

The study also reveals that the overall bill from road transport - which includes the cost of air pollution, congestion, accidents, road damage and global warming - is between £45.9 and 52.9 billion, of which road users pay only a third. The authors suggest that a more strategic "transport and health" policy is needed, and they recommend:

- further use of financial measures to discourage unnecessary car use;
- promotion and investment in public transport;
- promotion of eco-friendly fuels by fiscal measures;
- targeted information on air pollution to be given to the public in advance of poor air quality episodes;
- more research into the health effects of pollution to inform further policy changes.

**Transport and Pollution - the Health Costs* is available from the British Lung Foundation; for more information call Juliet Couche on 0171 439 7177.

LAPC ON INTERNET

The Department of the Environment, Transport and the Regions quarterly briefing note on local air pollution control can be found on the DETR's website at http://www.aeat.co.uk/netcen/airqual/info/labrief.html. The briefing includes an up-to-date list of process guidance notes, together with a list of LAPC developments over the last nine months.

WALK TO SCHOOL CAMPAIGN

In 1997, the "Walk to School" initiative promoted by The Pedestrians' Assocation as part of the Don't Choke Britain Campaign, encouraged an estimated three quarters of a million children across the country to walk to school.

This year, the Association is joining forces with TravelWise - the consortium of local authorities involved in traffic awareness campaigns - to encourage children and their parents to walk to school regularly throughout the year. The Association points out that all the reasons why walking to school is so important can neatly be banded together under the heading of "health". Children are being led into increasingly unhealthy lifestyles - fewer active games are played during school recreation periods and more leisure time at home is spent on playing computer games. By walking to and from school, children will not only have a more healthier lifestyle, but it will give them an opportunity to contribute to an improvement in air quality and practice the principles of road and pedestrian safety at the same time.

The Walk to School Campaign, promoted by The Pedestrians' Association and TravelWise, starts on 11 May 1998. Resources for use in schools and at home are available from The Pedestrians' Association, 126 Aldersgate Street, London EC1A 4JQ.

WASTE MANAGEMENT

The first edition of a new annual statistical bulletin (*Municipal Waste Management 1995/96*) was published by the DETR in January. It contains the results of an analysis of information provided by almost 90% of English and Welsh authorities on the collection, disposal and recycling of household and municipal waste during 1995/96. Points of interest include:

- almost 26 million tonnes of municipal wastes were generated in England and Wales, of which just over 90% was derived from household sources;
- on average 83% of municipal waste handled by waste disposal authorities is disposed of to landfill - with authorities in the North, South West, West Midlands and South East reporting proportions below the average. Approximately 12% of municipal waste had value recovered from it through materials recycling, central composting or energy from waste; the proportion of waste recovered varies from around 3% in the East Midlands and North West to around 18% in the South East and South West;
- households produce an average of 21 kg of waste each week, with higher rates of waste generated from households with wheeled bins;
- 6.5% of household waste was separately collected for recycling or composting, with glass, paper and card accounting for 60%; 118 waste collection authorities operate separate kerbside recycling schemes, which nationally account for 16% of households; 149 WCAs had distributed home composting bins in recent years, of which one-third were distributed free of charge.

LA RECYCLING PLANS

Revised guidance to local authorities on the preparation and revision of recycling plans was published in early March, with the aim of helping LAs to achieve the target of recovering value from 40% of municipal waste by 2005.

As well as updating the existing 1991 guidance, the new guidance takes into account the recommendations of the report of the Review Group on the Local Authority Role in Recycling, published last year. The guidance reflects the model for the LA role developed by the Review Group: i.e, that the two tiers of local government (waste disposal and waste collection authorities, and the different parts of unitary authorities) should together develop a coordinated approach to municipal waste management in their area, which integrates the various treatment and disposal options for municipal waste. They should assume a wider enabling and coordinating role aimed at promoting the objectives of the waste strategy; they should also encompass contributions from private and voluntary sectors, who are active independently in promoting sustainable waste management practices for municipal waste.

MEDIATION - A GROWING SERVICE

The use of mediation as a means of solving problems without resort to more formal procedures has become increasingly widespread during recent years, with a particularly rapid rate of growth in the number of community mediation services - there are now nearly 100 such services covering most of Britain, dealing with several thousand disputes each year. The main reason for this growth has been the interest of local authorities seeking to alleviate the pressure on housing and environmental health officers.

To accompany this growth a comprehensive accreditation programme for services has been instituted with an NVQ for mediators expected to be available in 1998; there is also a wide range of materials to support the development, training and practice of mediation.

Between 17-18 June the annual Mediation UK conference "Faces of Mediation" takes place at the University of Sheffield; it will be the largest gathering of its kind in Europe, with up to 400 participants expected - these will include practitioners, academics, those interested in setting up a service in their area and enthusiasts. Joe Folger, one of the leading American figures in the American mediation world will speak and present a workshop, and a senior Government spokesman to talk about its radical approach to neighbourhood problems is also expected.

AQ RESOURCE CENTRE

An Air Quality Management Resource Centre has been established at the University of the West of England to provide a comprehensive service to all professionals working in the field of air quality management. During 1998, the Centre will be a free facility for all AQM practitioners and service providers in the West of England. The key objectives of the Centre are:

- to become a focal point for information on air quality management for practitioners in the West of England, and to service their environmental information needs;
- to coordinate a network of AQM practitioners in the region and to facilitate network activities;
- to provide a forum for organisations and businesses involved in AQM;
- to provide training courses, workshops and seminars on aspects of AQM;
- to provide access to expert surgeries for university specialists in all aspects of AQM.

For more details contact Nicky Woodfield at the West of England Air Quality Management Resource Centre in Bristol, Tel: 0117 976 2716. Email: nk-woodfield@uwe.ac.uk

ENVIRONMENTAL INFORMATION ON THE INTERNET

As part of their Right to Know Campaign, Friends of the Earth launched an interactive map of HMIP's (now Environment Agency's) Chemical Release Inventory on the Internet in October 1995. Information on registered processes has been superimposed on postcoded maps of England and Wales. By entering a postcode, local industries and their emissions can be instantly accessed. Explanatory information and links to the Agency's home page and the US EPA's substance factsheets make this an invaluable resource. According to FOE, within hours of going online more people had visited the site than consult the Agency's registers in a year. FOE's CRI can be found at http://www.foe.co.uk/cri

NSCA Divisional Meetings

Information about these events is available from Divisional Secretaries.
Contact numbers are on p.82.

East Midlands

25 June: AGM, Rolls Royce, Derby

17 September: Severn Trent Water, Cropston Visitors Centre

Northern

2 July: Seminar - hosts Blythe BC; presentations on noise mediation and new housing tenancies

South East

19 May, AGM, Old Guy's Hospital, London SE1

Wales

12 June: Council meeting, Neath Port Talbot CBC

18 September: Council meeting, venue to be confirmed

16 October: AGM, venue to be confirmed

27 November: Council meeting, venue to be confirmed

MEMBERS' NEWS

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

The launch of the NSCA Cleaner Fuels Forum report at the Royal Society of Arts in London brought together many of the Society's corporate and local authority members. The launch was introduced by our President **Sir Crispin Tickell** and chaired by Vice-President **Steven Norris.** The keynote address was given by Transport Minister **Glenda Jackson** (pictured below).

picture: Paul Marriott, courtesy of Fleet News

The Environment Agency has appointed **CES** as lead consultant on a research study into the risks to human health at waste transfer stations. The study will involve monitoring at five transfer stations to ascertain exposure of employees and those beyond the site boundary to airborne contaminants, noise, electromagnetic fields and mirobiological hazards.

All the carbon dioxide emitted from the use of **Tesco** low benzene petrol will be reabsorbed by a tree. That's roughly the effect of the Climate Care Warranty purchased by Tesco from the Carbon Storage Trust. Under the terms of the warranty, the Trust undertakes to plant enough trees to absorb the same amount of CO_2 emitted by low benzene petrol purchased at London branches of Tesco.

The theme of this year's **Esso** "Walk in the Woods" scheme is Favourite Trees. Running throughout May, the initiative aims to encourage people to visit and enjoy the UK's national woodland heritage. Details on 0345 078139.

Sainsbury's Homebase chain has launched locally-sourced firewood in 17 of its stores in the South East. The wood in endorsed by Forest Stewardship Council and is provided by Bioregional Charcoal - which specialises in regional sourcing - from woodlands in Berkshire, Suffolk and Surrey. We hope it's also labelled as "not for use in smoke control areas"!

The **South East** Division is planning a membership drive. Divisional Chairman F John Smith is writing to lapsed and non-member local authorities in the area to encourage them to join the Society. The Divisional Council has three new members: Philip Thompson, Chief EHO of the Corporation of London; Ron Gibson, Strategic Pollution Officer, LB Hounslow; and Linda Davies, a researcher from Imperial College. Linda will be addressing the AGM on 16 May on the subject of Biological Monitoring and Air Pollution. The AGM is at Old Guy's Hospital, London SE1.

The British Geological Survey at Keyworth, Nottingham, hosted the February meeting of the **East Midlands** Division - attended by a record 95 members and guests. The business meeting was followed by two presentations on contaminated land: Griffen Dixon of Corsair Ltd looked at what local authorities should be doing in advance of the legislation coming into force; and David Bridges of the BGS described work undertaken in conjunction with Nottingham University in relation to a contamintated land project in Wolverhampton. A final presentation from Don Appleton of BGS described recent developments in radon potential mapping and site investigations.

Members of the E. Midlands Division at the BGS; photo credit NERC

BOOKS & REPORTS

Lead and Public Health. *E. Millstone, Earthscan, 1997. ISBN 1 8538 3311 8. £12.95.*

Lead and Public Health provides an authoritative and accessible guide to one of our society's most pervasive environmental health problems. Focusing on the evidence concerning the effects of lead on child health, it examines the development of the scientific debate concerning the toxicology of lead over the last twenty years and the comparative regulatory responses to this problem in the US and the UK. In so doing Millstone presents compelling evidence that relatively low level exposure from old leaded paint and water pipes is causing serious damage to the mental development of young children.

Furthermore, this approach provides Millstone with detailed comparative evidence to support his claim that the British Government's record on lead "... has been and remains, one of neglect and irresponsibility." Drawing upon US practice, he sets out a shopping list of policy measures which should be implemented here: from strengthened standards and a childhood blood lead monitoring programme, to an effective public information campaign and action on old leaded paint. Although it does not deal with the recent treatment of airborne lead pollution under the UK National Air Quality Strategy, *Lead and Public Health* should provide essential reading for all of those concerned with UK environmental health policy, not least the Minister for Public Health.

The Law of Waste Management. *David Pocklington, Shaw & Sons, 1997. ISBN 0 7219 1520 5. £45.00.*
An extremely comprehensive and clearly written book which will be of great help not only to those working in the waste industry and those enforcing the law, but also to lay people wanting a working knowledge of waste management legislation either for study or personal interest. The wide range of legislation covered - including that not obviously "waste" - clearly demonstrates the increasingly integrated nature of UK pollution legislation. The book is current to 1 September 1997 and also covers EU and international measures.

Industrial Air Pollution Monitoring. *Ed. A.G. Clarke, Chapman Hall, 1998. ISBN 4 1263 390 6. £55.00.*
This book aims to proivde an in-depth survey of all the techniques available for monitoring emissions of air pollutants from stationary sources in line with current legislation and standards.

Generation in the 1990s: Electricity Capacity and New Power Projects (1997 Edition). *OXERA Press, 1997. ISBN 1 8734 8234 5. £265.00.*
Putting the current electricity generation market into context, it presents an overview of the present state of the market and possible future developments. Part I analyses developments in the generation sector over the previous 12 months, and Part II lists all new generation projects.

Acid Rain in Europe - Counting the Cost. *Ed H. ApSimon et al. Earthscan, 1997. ISBN 1 85383 443 2. £19.95.*
An interdisciplinary look at the economic impact of acidification. Divided into three parts, it examines acidification in the context of methodologies of scientific measurement, environmental impacts and economic consequences, and policy options.

Acid Earth: the Politics of Acid Pollution. *John McCormick. Earthscan, 1997. ISBN 1 85383 298 7. £12.95.*
A third edition of this established text on acid pollution. Acid rain was a major environmental issue in the 1980s. While industrialised countries have taken measures to reduce emissions of acid pollutants, the developing countries of Asia and Latin America are now facing up to acidification. Updated and revised, Acid Earth is a concise and comprehensible guide to the science and politics of acid pollution.

Fuel Efficient Car Technology. *M.L. Poulton. Computational Mechanics Publications, 1997. ISBN 1 85312 447 8. £59.00.*
In modern cars about three-quarters of the energy in fuel is wasted. This book examines a range of fuel economy measures currently being tested by vehicle manufacturers. Covering technologies being tested worldwide, options range from adjustments to engines to complete vehicle redesign..

Environmental Information: A Guide to Sources. *N. Lees, H. Woolston. British Library, 1997. ISBN 0 71230 825 3. £32.00.*
Originally published in 1992, this guide has been updated to 1997. It aims to provide a comprehensive sourcebook for environmental information. Divided into subject headings, it lists databases, printed sources and organisations. Unfortunately, the NSCA entry is inaccurate, but it does call NSCA "one of the most important organisations specialising in information, education and events on air pollution"!

Business, Pollution and Regulation. *S. Simpson, J. Carless. British Library, 1997. ISBN 0 712 308 20 2. £32.00.*
Aimed at small to medium enterprises which as yet have no environmental policy, this book gives an overview of environmental issues that should concern business and industry. It oulines the regulatory framework and management tools; appendices list regulators and contacts.

ENDS Environmental Consultants Directory (1997-98). *Environmental Data Services, 1997. ISBN 0 90767 312 0. £49.95 (ENDS subscribers £39.95).*
The original guide to environmental consultants is now in its fifth edition. It has been designed to assist potential clients in finding a suitable consultancy and to assess whether a consultancy is suited to the job. Nearly 400 consultancies are listed alphabetically, geographically and by specialisation; 128 consultancies have a full profile detailing areas of expertise.

Dynamics of Meteorology and Climate. *R.S. Scorer. John Wiley, 1998. ISBN 0 471 96816 1. £29.95.*
This book presents a discourse on fluid mechanics, an understanding of which is essential to understanding air flow and climate patterns. It is divided into three parts: fundamental theory, vorticity, waves and instability; turbulent phenomena, clouds and dispersion; and forecasting and climate change. It is aimed at undergraduate and postgraduate environmental science, physical science and engineering students.

Climate Impact and Adaptation Assessment - A Guide to the IPPC Approach. *M. Parry, T. Carter. Earthscan, 1998. 1 85383 266 9. £14.95.*
A step by step guide to current methods of assessing the impacts from, and potential adaptations to, changes of climate. The structure of the book follows a seven step strategy approved by the Intergovernmental Panel on Climate Change: definition of the problem, selection of the method, test of the method, selection of the scenarios, assessment of impact, assessment of autonomous adjustments, evaluation and appropriate adaptation strategies. It provides an illustrated guide for anyone imvolved in impact assessment and policy formulation.

FUTURE EVENTS

18-20 MAY - Course: Environmental Stakeholder Dialogue
Part 1 of intensive six day sandwich training course for facilitators, mediators and process managers providing a thorough grounding in consensus building, aimed at giving them confidence to start using it in meetings, workshops and round tables. Part 2 from 6-8 July.
Details: Freya Levy, Environment Council, Tel: 0171 881 7614.

17-19 JUNE - Faces of Mediation
Mediation UK's annual conference featuring participatory workshops, presentations and plenaries on all aspects of mediation services.
Venue: Ranmoor Hall, University of Sheffield.
Details: Jane Lord. Fax: 0117 904 3331.

13-18 SEPTEMBER - 11th World Clean Air & Environment Congress
The contribution of developing countries to regional and global air pollution is likely to become increasingly significant; while developing countries may take note of environmental management and technology of developed countries, it is important for them to maintain sustainable development. However, the interface between developing and developed countries must bring about the evolution of appropriate international environmental management. Convened by the International Union of Air Pollution Prevention and Environmental Protection Associations (for which NSCA provides the secretariat), and hosted by the National Association for Clean Air, South Africa.
Venue: Durban, South Africa.
Details: Ammie Wissing, PO Box 36782, Menlo Park, 0102 South Africa. Fax: +27 12 348 1563. Email: wissing@iafrica.com

15-18 SEPTEMBER - Environmental Health Congress & Exhibition
Annual CIEH congress with strategic plenary sessions and technical parallel sessions encompassing all aspects of environmental health.
Venue: Harrogate International Centre.
Details: CIEH Events Division. Fax: 0171 827 5868. Email: events@cieh.org.uk

29-30 OCTOBER - Air Transport Infrastructure & the Environment
What is the real economic and environmental impact of air transport - airlines, airports, manufacturing and maintenance - on the environment and how can balance be achieved and maintained?
Venue: The Radisson/SAS Portman Hotel, London.
Details: Clive Rigden, Aeronautica Communications. Fax: 0181 893 3796. Email: info@aeronautica.co.uk

FORTHCOMING NSCA EVENTS

Monday 27 - Tuesday 28 April
Training Seminar (with SEIPH) - London
Estimating Road Traffic Emissions

Friday 1 May
Policy Seminar - London
Acid Rain - Assessing Environmental Damage & Recovery Prospects

Friday 22 May
Policy Seminar - London
Implementing IPPC

Wednesday 23 May
National Seminar - London
Particles and Air Quality

Wednesday 3 June
Training Seminar - Glasgow
Air Quality Review and Assessment

Wednesday 10 June
Workshop - London
UK Dispersion Model Users Group

Tuesday 16 June
Training Seminar - NEC Birmingham
Public Information and Air Quality

Monday 22 - Tuesday 23 June
Conference - London
in association with Eurocities Consortium and European Federation of Clean Air & Environmental Protection Associations
Air Quality in Europe

Tuesday 15 September 1998
Training Seminar - NEC Birmingham
Noise Update 98

Monday 26 - Thursday 29 October 1998
Annual Conference and Exhibition - Weston-super-Mare
Environmental Protection 98

The list of Divisional events will be found on page 109

For further details please contact
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136 North Street - Brighton BN1 1RG
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CLEAN AIR
AND ENVIRONMENTAL PROTECTION

July/August 1998

- NSCA - Local Environmental Management Forum
- Opportunities for Change - A Response
- Local Air Quality Management - Belfast & Bristol
- Contaminated Land - Proposed Regulatory Regime

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CONTENTS

The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

NATIONAL SOCIETY FOR CLEAN AIR AND ENVIRONMENTAL PROTECTION
(Founded 1899)
Registered Charity, Number 221026

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EDITORIAL

Local Environmental Management
An Opportunity for Change

Before the UK's European Presidency is out, EU Environment Ministers will have brought to completion a new framework for the management of air quality in Europe. For all its inevitable uncertainties and limitations it is a major achievement which owes much to the precedents of recent UK legislation and National Strategy. It also therefore owes not a little to the campaigning work of the NSCA at the time it was a lone voice on these matters.

It is appropriate therefore that the occasion should be marked, amongst other things, by a major Conference, *Cleaner Air for Europe*, which the Society held with the sponsorship and support of the EC, UK Government, Eurocities Consortium and the European Federation of Clean Air. The Conference looked at the remaining challenges and some of the lessons so far.

One lesson is paramount. Air Quality Management relies on planning, transport and other measures, and inter-relates closely with noise, waste and other policies. It cannot stand alone. It has to fit comfortably within a wider framework of local environmental management.

In recognition of this, the Society established last year a Local Environment Management Forum, to look at issues in the management of local environmental services in the round, and promote a more holistic and effective approach to them. The Forum's Steering Group, chaired by NSCA Vice-President, Derek Osborn, has now come forward with its first proposals, in a Statement of Aims and Objectives and in a response to *Opportunities for Change*, the Government's consultation paper on the Review of the Sustainable Development Strategy. Both are published in this edition of *Clean Air*.

It is clear there are major challenges here, which may take at least as long as the process of devloping local air quality management. But it is also clear that the issues go to the heart of the notion of 'sustainable communities' - and that now, with the review of the Sustainable Development Strategy, is a major opportunity for progress.

The ideas deserve the careful attention of all NSCA Divisions, member organisations and individual supporters.

NSCA NEWS & VIEWS

Local Environment Management Forum
An Introduction to the Aims and Objectives of the Forum

The NSCA Local Environment Management Forum was established last year to encourage the development of more effective environmental management at local level. It has also initiated three further projects: Reducing the Environmental Impact of Public Service and Commercial Fleets and Other Vehicles in Urban Areas; Environmental Management on Run-Down Estates and a review of Environmental Management Systems. The first task of the Forum has been a response to the consultation paper Opportunities for Change: a revised UK Strategy for sustainable development, which is published elsewhere in this edition of Clean Air. This statement sets out the aims, objectives and working methods of the Forum. Anyone interested in participating in its work is invited to contact the Society's Policy Officer.

Practical Management for Sustainability

The NSCA Local Environment Management Forum draws together organisations and individuals concerned with encouraging debate and innovation in the management of local environmental services. Within its general aim of fostering **effective policies** and **good practice** in pursuit of sustainable development at local level, it focuses on areas with a variety of stakeholder interests, where there is a need to clarify issues and develop consensus.

The focus is on three key elements of local environmental management:

- **Innovation** - policies and practices for individual local services - such as air quality, waste management, litter and noise.
- **Better structures** for tackling cross-cutting issues (including powers, organisation and resourcing) that currently affect all these services and, more generally, the principles and management systems underlying them; and for taking advantage of synergies between the various services.
- **Strengthening** the capability to ensure that environmental considerations are taken into account in the operation of other services - such as housing, health and transport.

Progress is now both urgent and possible. The Government has given a commitment to new powers and duties for local government in respect of the environmental, economic and social needs of their populations. If appropriately developed, proposals in *Opportunities for Change* (the consultation paper on a revised UK sustainable development strategy) and *Our Healthier Nation* (the green paper on public health), along with consultation documents on local government provide the basis for developing a better framework at local level - to link voluntary action, regulation and local authority responsibilities in pursuit of sustainable development.

Improvement in the management of the local environment is gaining increasing importance. Pressure for housing, and the Government's commitment to developing brownfield sites, mean measures must be taken if urban areas are to meet the aspirations of the growing number of households the Government expects to see accommodated within them.

Priorities for Progress in Local Environmental Management

While the Forum intends to provide a framework through which potential new policies can be developed and opportunities for progress emerge, it has identified a number of more specific objectives:

- to promote consensus on *principles of environmental management* applicable at local level, particularly the practical implications for local authorities and other local bodies;
- to pursue the implications of the new vision of environmental health expressed for instance, in the report of the Environmental Health Commission *Agendas for Change;*
- to encourage sharing of experience among local authorities and other relevant bodies on practical implementation of *environmental management systems*, their strengths and limitations, and their potential to promote progress towards sustainable development objectives;

- to encourage the implementation of measures to enable and support *voluntary action* at local level;
- to encourage wider debate on the key *cross-cutting issues* affecting local environmental services, including the balance of responsibilities between central and local authorities (and between different authorities); the scope for further integration of services at local level; strengthening the enforcement of local environmental regulation; encouraging voluntary effort within a sustainable democratic framework, without entailing excessive short-term reliance on it.

Principles and Occupational Standards for Local Environment Management

The Rio principles of sustainability provide general philosophical objectives for environmental management. However, if they are to guide and assist the work of local environmental managers in a practical way, they need to be continuously fleshed out and developed. The aim must be to find ways of developing debate and sharing experience which enable individuals - particularly local authority officers - to see the relevance and implications of these principles to the decisions they take.

So long as they are seen against a wider backdrop of public participation, occupational standards for environmental management - such as those suggested for discussion below - may have particular potential to make these principles more relevant to individual managers. They can provide a framework within which sustainable development goals can be pursued; help identify the management skills required for this; and provide a benchmark for testing decisions and actions. The following principles are suggested:

- to adopt a long-term perspective that takes into account the needs of the present and future generations;
- to seek to influence others to improve the environmental performance of the organisation;
- to appraise activities, products and/or services with regard to the likely costs and benefits to the organisation and the environment;
- to seek to work within the assimilative capacity of the environment to minimise the adverse impact of all work activities;
- to collaborate and consult openly with interested parties;
- to move the organisation towards closed loop systems rather than use linear 'extract-consume-dispose' approaches and refine activities to involve the use of more environmentally benign materials;
- to recognise and promote the importance of prevention rather than cure and take precautionary action where uncertainty exists;
- to ensure the best available techniques that do not entail excessive costs;
- to ensure that solutions do not lead to worse problems.

An essential aim of the Forum is to encourage debate and good practice on how such core principles are most effectively interpreted and applied within the day-to-day operation of local environmental services. There is a need to determine how such principles should affect action and how they should be used to test decisions.

The New Vision for Environmental Health

The Report of the Commission on Environmental Health, *Agendas for Change,* sets out a challenging new vision for environmental health in the UK. At its core is the need to bring public and environmental health closer together at local, national and international levels. To achieve this the Commission recommended several measures which, it believes would lead to a more integrated approach by all concerned in the pursuit of sustainable development. The proposed new powers for local authorities and the sustainable development consultation *Opportunities for Change* offer a key opportunity to carry these issues forward.

The Forum will particularly look to develop the following issues:

- the local integration of environment and public health;
- coordination of local authority functions to better achieve sustainable development objectives;
- targeting of systems and services to improve urban regeneration, housing conditions and integrated and less polluting transport systems.

A new approach to environmental health, such as that proposed by the Environmental Health Commission, needs to be pursued at many levels. As a priority, therefore, the Forum aims to contribute to this process by distilling the implications for practical issues in local environmental management.

Management and Audit Systems for the Local Environment

It is seldom easy for individuals, whether in local authorities or elsewhere, to relate broad principles of environmental management and new philosophies of environmental health coherently to their roles and responsibilities, nor for local authorities to judge their own overall performance in relation to them. Environmental Management Systems should therefore have an important role to play, both within an authority and in wider activities. Many authorities are already looking to such systems, not only to improve their environmental performance and ensure regulatory compliance, but to promote a quality system which permeates into the normal working practice of the organisation. Such practices ensure automatic consideration of the environment in all operational and policy actions.

Authorities who are publicly implementing an environmental management system, such as EMAS or ISO 14001, can act as flagships for their areas and encourage local business to examine the competitive benefits of such systems. The potential benefits to the local environment of implementation of Environmental Management Systems, by small as well as large employers in an area, should be considerable.

The Forum aims to promote wider debate on the lessons from early experience of such systems; and how far they can promote practical management for sustainability.

Policies and Structures

New models of environmental health and new local environmental management principles and systems will bring into starker relief fundamental cross-cutting issues about the structure and functioning of local environmental management, the range of environmental services and their mode of operation. These include:

- the scope for greater flexibility in implementation of national policies and initiatives at local level;
- the need to provide for better integration of related policy areas at local level;
- the need to give greater prominence to management and maintenance as against strategic policy and new development;
- the need to improve the enforcement of environmental regulation; particularly at the boundary between anti-social and criminal activity;
- the need to encourage voluntary effort - within a transparent democratic framework - without placing unrealistic reliance upon it, and to enable best practice in the voluntary sector.

These issues must be addressed if the vision of sustainable development is to find viable practical expression at local level. Local authorities and local democracy have for some years been in decline - not least in relation to local environmental services, but the present Government has indicated support for widening powers and capabilities.

The Forum will be concerned with exploring some of the fundamental issues of policy and organisation which need to be addressed if any process for revitalising and strengthening democratic stewardship of the local environment is to be successful.

Methods of Working

In promoting discussion and good practice, the Forum will work initially through the **conference** and **seminar** programme of the NSCA and partner organisations. This will be supplemented by additional meetings and seminars. In particular, it is planned to hold open forum meetings at regional level to take forward some of the specific themes emerging from the Forum's work.

To help structure the Forum's work, focused **policy reviews** will be produced, particularly on the main areas of priority interest identified in the previous section. It is intended that in most cases the form and timetable for these should emerge from discussions within the Forum. To underpin this, the Steering Group has commissioned a review of research and information sources, which is being undertaken directly by NSCA staff and linked to the Society's Information Service.

A priority for the Forum will be the encouragement and support of **experimental projects** designed to test **new approaches** and spread **good practice**. These will be selected because they require the involvement of a variety of stakeholders with differing interests and may not therefore comfortably fit the programme of local authorities or other sectoral interests. In support of this research will be undertaken to find examples of existing good practice both in the UK and internationally.

The Forum provides a mechanism to support debate, develop consensus, and promote innovation and good practice among the variety of interests involved in local environment management. The main impetus must come from local authorities themselves, individually and collectively. However, their work needs to be supported and reinforced by bodies with wider interests.

Opportunities for Change
A Revised UK Strategy for Sustainable Development

Comments by the Local Environment Management Forum

Earlier this year, the Government published the consultation paper on a revised UK sustainable development strategy, Opportunities for Change, inviting comment by 29 May. This paper gives the response, as submitted, of the local Environment Management Forum to the consultation paper. The response focuses on the implementation of sustainable developemnt at a local level and was submitted in parallel to the Society's more general response (available from Sally May) which looked at National implications.

1. Introduction and General Comments

1.1 The NSCA Local Environment Management Forum draws together organisations and individuals concerned with encouraging debate and innovation in the management of local environmental services. Its focus is on three key elements of local environmental management:

- Innovation - policies and practices for individual local services - such as air quality, waste management, litter and noise.
- Better structures for tackling cross-cutting issues (including powers, organisation and resourcing) that currently affect all these services and, more generally, the principles and management systems underlying them; and for taking advantage of synergies between the various services.
- Strengthening the capability to ensure that environmental considerations are taken into account in the operation of other services - such as housing, health and transport.

1.2 The Forum sees sustainable development as providing the crucial over-arching framework within which local authorities and local communities can achieve these integrating objectives. It is therefore vitally important that in following through the national sustainable development strategy the Government gives a strong reinforcement to the powers, duties and structures that will enable local authorities to give a central place to sustainable development in their own work. Similarly sustainable development ought to play a crucial part at the centre of the strategies of regional assemblies and other regional structures.

1.3 The publication of *Opportunities For Change* at the same time as a wide range of consultation papers on transport, health, local government and other policy areas relevant to sustainable development, makes this a unique opportunity to carry forward its practical application, and to bring about better integration at local level. But this will only happen if those initiatives and the results of those separate consultations are brought together at the next stage to achieve effective integration at local level within the framework of local sustainable development strategies.

1.4 The key recommendation of the Local Environment Management Forum is that local authorities should be placed under a statutory duty to prepare local sustainable development strategies and that these should become the central means of ensuring proper co-ordination and integration of local authority functions in a sustainable framework at local level. There need to be clear objectives and targets; measures to make the practical implications of sustainability discernible in everyday terms; and close integration of major sectoral policies within the sustainable development framework.

1.5 Working this through in detail will be a major task and will require creative input from many different professions and departments at both local and national level. The Forum therefore suggests that in order to carry this subject forward the Government should consider establishing an authoritative and broadly-based high-level committee to develop detailed recommendations. This should include advising on the way in which local sustainable development strategies should be created, how they should influence and shape other activities and policies of local government, and the contribution they should make to the fulfilment of regional and national sustainable development strategies.

2. Detailed Comments. Building Sustainable Communities

2.1 In the remainder of this response, the Local Environment Management Forum focuses more closely on certain specific questions within its area of interest and expertise, notably those concerning Building Sustainable Communities (paragraphs 32 to 59) and particularly the planning system (paragraph 41), transport and health of the consultation document.

2.2 The local level is crucial for sustainable development. It is at this level that the general principles of sustainability, and of integration between different policy areas have to come together in hard decisions about development and other issues on the ground. It is here that critical sustainability challenges have to be resolved, including such issues as:

- How to integrate traffic and land-use planning so as to increase accessibility, and reduce overall demand for private transport movement.

- How to encourage the construction of more sustainable housing in the future, and improve the sustainability of the existing housing stock.
- How to encourage all sectors of the community to play their part in energy conservation, and in waste minimisation and recycling.

It is at this level that national and regional policies have effect and that the policies for all the different functions and services must be brought together in an effective balance. The Forum considers that major opportunities now lie open for advancing sustainability through better integration of policies and services within the framework of sustainability principles; new approaches to local environmental management; and the reform of local government powers and functions.

2.3 The reanimation of local democracy, which the Government is seeking to bring about through its policies for the regions and local government, provides an excellent opportunity for promoting sustainable development at the local and regional level. Sustainable development is a particularly appropriate over-arching vision and purpose to animate and unify activity at these levels. But to do so properly it needs to be built in from the outset as a central objective of those bodies, and one which should shape their central strategies and plans.

2.4 Sustainable development is not simply an environmental issue and therefore an issue for environment departments alone. It is an approach which moves environmental, social and economic concerns forward in equal measure and thus touches virtually every strand of government and does so at every level. This will necessitate a shift in culture within government, away from departmentalism and towards co-operation and cross working. Mechanisms need to be put in place to ensure that it happens.

2.5 The NSCA general response (available from Sally May) comments on the implications of this at a national level. Sustainable communities require a parallel shift at a local level. The forum welcomes the fact that the Government has made a commitment to impose a duty on local authorities to take account of economic, social and environmental factors when carrying out their functions. This has not been explicitly linked with the sustainable development strategy but it would appear to provide an excellent opportunity to put the principles of sustainable development into practice.

2.6 In order to provide a framework within which this could happen, the Government should set out how much each level of government (central, regional, local, community) can contribute to any given objective and what the responsibilities of each level are. The focus of this exercise should be a set of explicit, long term objectives for sustainable development

2.7 The duty mentioned above should oblige local and regional authorities to:

- produce a sustainable development strategy, appropriate to the scale of the authority, which encompasses land use planning, transport planning, air quality, noise, primary resource use, waste management, housing, health, social policy, economic development.
- produce an annual sustainable development statement to replace the current annual economic development statement.
- promote public understanding of sustainable development and ensure the participation of the public in the development of their local strategy.

2.8 Legislation and guidance will be required to ensure that all local authorities implement these new duties but, rather than imposing them, the Government should first seek to achieve consensus by negotiation with the authorities and the various professional bodies involved.

2.9 Increasingly, Government policy has adopted the approach of general policies to address the general problem with the addition of locally focused "action zones" to deal with local problems. Health, education, employment and air quality are all areas where this approach will be or is being applied. Such an approach opens the way for further integration at the "sharp end" of policy implementation and the inclusion of sustainable development criteria.

2.10 It is not possible to reform local government and revitalise local communities without looking, at the same time, at the national and European levels. In doing so the local level should be predominant and the key issue one of subsidiarity. The Sustainable Development Strategy should therefore promote the major changes in the balance of and relationship between the national and local levels required to bring about sustainable communities. The over-riding objective should be to emphasise and enhance the role and integrity of local communities, which can only be achieved by strengthening their real powers and responsibilities.

2.11 Finally, new structures and sustainable development powers for local government will bring into starker relief fundamental cross-cutting issues about the nature and functioning of local environmental management, the range of environmental services and their mode of operation. Along with new statutory powers should come a new philosophy and priorities for local environmental management based on:

- greater flexibility at local level in the implementation of national policies and initiatives;
- better integration of related policy areas at local level and mechanisms for resolving conflicts;
- stronger focus on and more resources for management and maintenance as against new development;

- improved public information about environmental requirements and better enforcement of environmental regulation, particularly at the boundary between anti-social and criminal activity;
- encouragement for voluntary effort within a transparent democratic framework, and for participation in sustainable development planning and action;
- encouragement for full participation by business in local sustainable development, with support for environmental management and good practice by businesses of all sizes.

2.12 These issues must be addressed if the vision of sustainable development is to find viable practical expression at local level. Local authorities and local democracy have, for some years, been in decline, not least in relation to local environmental services. The present Government has indicated support for widening powers and capabilities and it is essential this is carried through within the framework of the revised Sustainable Development Strategy.

Planning

2.13 The planning system provides the framework within which conflicting policies and values must be reconciled at a local level. It is essential that a long range programme should be initiated to review how such action should take place on the basis of sustainable development.

2.14 The key concepts in the introduction of sustainable development into the planning system are participation, flexibility, transparency and objectivity. Of all local government functions, planning has the greatest experience of public consultation but to many members of the public it still appears a complex and impenetrable system. In order to fully engage the public, local authorities have to go beyond consultation and develop better ways of ensuring participation. The most effective methods will vary from area to area and so local authorities need the flexibility to develop their own strategies for providing information and promoting participation. What is needed from the Government is not a prescriptive approach to participation but a set of objectives by which each approach can be assessed, together with guidance on good practice.

2.15 Experience has shown that there is no shortage of new and creative participation and consultation tools, such as village appraisals, "Planning for Real", and future search. Local authorities need objectives and a process to allow them to find which will work best for their area. Often these approaches require resources in terms of staff time and support, resources which are in short supply. Nevertheless effective participation and consultation can sometimes save a great deal of time and resource in dealing with objections at a later stage of the planning and development process.

Health

2.16 In terms of sustainable development and the promotion of sustainable communities, two major new directions are now required. Firstly, while the consultation paper recognises the value of preventative methods, it is not explicit about the advantages of a policy shift away from curative medicine and towards preventative methods. Prevention through improving people's environments and quality of life can help to achieve many of the targets set in *Our Healthier Nation* in a longer term and sustainable way. The incidence of ill health can also be a very clear signal of the need to prioritise environmental improvements and social measures in a deprived area. Such measures may permanently reduce demand on health services generally as people's life styles change and therefore reduce the resources required to provide those services.

2.17 To a certain extent, continued increases in expenditure on curative medicine have the same effect on demands for health services as building more roads has on traffic growth. Increasing the services offered will, in turn, increase the demand for those services. Prevention, by contrast, seeks to decrease this demand and increase the health of society by ensuring that individuals do not become ill in the first place. The benefits of a strong preventative system are therefore a more sustainable health service but, despite this, the level of resources targeted towards prevention is small compared to the level targeted at curative medicine. *Our Healthier Nation* should be explicit in making a policy shift away from an emphasis on curative medicine and towards preventative methods.

2.18 The second area concerns the local structures of health provision and their accessibility to the general public, including decision and policy making processes. Health authorities and NHS Trusts are perceived as remote and impenetrable to the individual and are therefore not accountable to the communities which they serve. The air of mystique and professional expertise which still surrounds the medical profession also pervades its administration and structures and this needs to be broken down. There should be an objective assessment of the way in which the "health service" operates to ensure that policies and decisions are taken in a clear and objective way, that the processes are transparent and inclusive and that there is accountability in the interests of local democracy.

Transport

2.19 *Opportunities for Change* makes very little mention of transport, mainly within sections of land use planning and air quality, essentially consigning issues of sustainable transport to the forthcoming White Paper on an integrated transport strategy. This must only be a temporary omission. There are two strong reasons why transport should be given high priority within the final sustainable development strategy. Firstly, transport is not simply an environmental issue, nor is it simply a planning issue.

Transport, mobility and access and the equitable provision of these, is a key element of sustainable development and sustainable communities in its own right. One of the Local Government Management Board's "13 Themes of Sustainable Development" states that:

"*A sustainable community would be one in which...access to facilities, services, goods and other people is not achieved at the expense of the environment or limited to those with cars.*"

2.20 Secondly, transport, and particularly road transport, is currently one of the least sustainable aspects of our society, a fact to which the Royal Commission on Environmental Pollution has drawn attention and which has been exacerbated by successive transport policies. Because of its central role in our communities, the development of a sustainable transport system will go a long way towards the development of sustainable communities and to ensuring that sustainable development can become a reality.

2.21 Taken in isolation, transport is a negative aspect of modern life. We all spend a significant amount of our time engaged in transport, often in private vehicles, which, looked at from another perspective, means we spend a significant amount of time inactive. Likewise, the products we use and the food we eat spend a significant amount of time in "mobile storage". One of the consequences of this apparent inactivity and storage is a large amount of energy and resource use. It is only when the reasons for that transport use are added in that the beneficial aspects emerge. By regarding transport from this perspective, such beneficial or legitimate uses can be fully and objectively evaluated and the transport activities which, while they have become a part of everyday life are nevertheless detrimental to society can be reduced.

2.22 The general principle guiding the development of an integrated transport policy should be to ensure access for legitimate use. Such access should not be at the expense of others or the environment and should be provided in the most efficient form possible. Following this principle provides an objective for subsequent policy decisions and initiatives and tends to ensure that issues of equity do not become a problem.

SG TO CHAIR ENVIRONMENTAL ANALYSIS COOPERATIVE

The Environmental Analysis Cooperative was established in 1995 on the initiative of the Environment Agency (then HMIP) to develop guidance and promote good practice on Integrated Pollution Control applications. It works on a collaborative basis, between industrial operators, regulatory bodies and environmental groups. The first set of guidance on how to assess IPC processes, was published in 1996.

At a recent meeting the Steering Group agreed publication - probably as a single volume in the autumn - of three further studies, covering interfaces between regulatory systems, the assessment of ambient quality and the treatment of triviality. A third stage work programme was also agreed under which the Cooperative will develop similar guidance to underpin the new IPPC regime.

At the same meeting the NSCA's Secretary General, Richard Mills, was elected Chairman of the Cooperative in succession to Dr. John Burdett from the Environment Agency. Commenting on his appointment, the Secretary General said "the NSCA has always been strongly supportive of the EAC in its role in bringing industrial operators and regulators closer together in the development of good practice. I look forward to contributing actively, on behalf of the Society, to carrying this work forward".

NSCA POLICY OFFICER

The Brighton Office gave a warm welcome to Tim Williamson who took up his appointment as Policy Officer on 14 April. Tim comes to the Society from Coventry City Council where he had worked since May 1994 in three different and challenging roles: Environmental Protection Officer, Local Agenda 21 Officer and Air Quality Officer. He obtained his degree in Environmental Health from Leeds Metropolitan University in 1992 and an MSc in Pollution Control from the University of Leeds in 1993.

NSCA WEBSITE

The NSCA website has been redesigned to provide instant access to all information material. The full text of factsheets and leaflets is now online. Publications, future events, recent press releases and policy information are also being put online. The site gives links to some other sites.

Please visit the site at http://www3.mistral.co.uk/cleanair and forward any suggestions for further links or information you think it would be helpful to Mary Stevens at info@nsca.org.uk

REPORTS

The Proposed Contaminated Land Regime: Current Status

Dr. Richard Carpenter
Aspinwall & Company Ltd

Draft Statutory Guidance on Contaminated Land was published in September 1996 for the purpose of widespread consultation in the industry; the content of the guidance was developed via a series of informal drafts over the previous two years.

This paper looks at the practical implications of the guidance (assuming that it maintains its current direction) for the ownership and redevelopment of contaminated land, and then describes the basics of the risk assessment process. Finally it considers a few comments so far highlighted via the consultation process and recent developments affecting the timescale for implementation.

This paper was presented at the NSCA West Midlands Division seminar on 11 December 1997.

1. The New Approach to Contaminated Land

When the regulations to support section 57 of the *Environment Act 1995* come into being, a formal framework will exist which sets out two ways of dealing with land which may be contaminated:

- via development, and governed by planning law; and
- via remediation to control risks to humans and the environment, and governed by other law such as the *Water Resources Act 1991* as well as the new *Environment Act.*

The Development Route

Where land is identified as contaminated and posing a threat of significant harm to humans or pollution of water, the risks can be dealt with via the planning process, provided that development is to take place. In just the same way as occurs presently, planners who receive an application for development of potentially contaminated land can take one of several paths to concluding a successful development. On receipt of a planning application, they may:

a) ask for further information (perhaps site investigation) to confirm that the site can actually be used for the proposed purpose;

b) grant permission, subject to conditions relating to further site investigation, remediation, long term maintenance and management; and

c) grant permission subject to a Section 106 Legal Agreement which would be more appropriate if long term (greater than five years) management of the site remediation is required.

Provided that adequate conditions or agreements are put in place to control the identified risks, then the development-led control of such contaminated land will provide a cost-effective means of bringing it back into beneficial use.

The Remediation Route

Where land is identified as causing significant harm to health or pollution of water, and no new development is proposed, then the site will come under the remit of either the *Environment Act* or one of the complementary laws such as the *Water Resources Act.* In the draft Statutory Guidance to the *Environment Act*, it is clear that a pro-active approach is being encouraged on the part of polluters and landowners to dealing with identified risks. Where land is identified as contaminated in accordance with the section 57 definition, it is hoped that the polluter and any other responsible parties (for instance the landowner or a tenant who has contributed to the pollution) will take steps to carry out such remediation works as are necessary to control risks. If these works are carried out voluntarily, then the Regulator (who may be either the local authority, or for special sites, the Environment Agency) would not serve a Statutory Notice. However, if the appropriate person did not take action, then he/she would be served with a Remediation Notice to carry out identified works. Failure to carry out the work on service of a notice could lead to the work being carried out by the Regulator, and being recharged to the appropriate person.

Whichever route is appropriate for progressing the remediation of land, the risk assessment process forms the basis for identifying the need for remediation and its full extent.

2. Risk Assessment in the Context of the Draft Statutory Guidance

Risk assessment is the semi-formal process by which the significance of contamination on a site can be determined with respect to sensitive targets. The procedure can be quantitative or qualitative, depending upon the availability of data and the degree of sophistication considered necessary, and may consider a single target (such as a human in respect of health) or a range (human health, water quality, building materials etc).

Risk may be defined as the combination of:

- the probability, or frequency, of occurrence of a defined hazard;
- the magnitude (including the seriousness) of the consequences to a specified receptor.

The steps to be followed are shown in the diagram. Where all three components (source, pathway and target) are present and linked, then there is a potential risk.

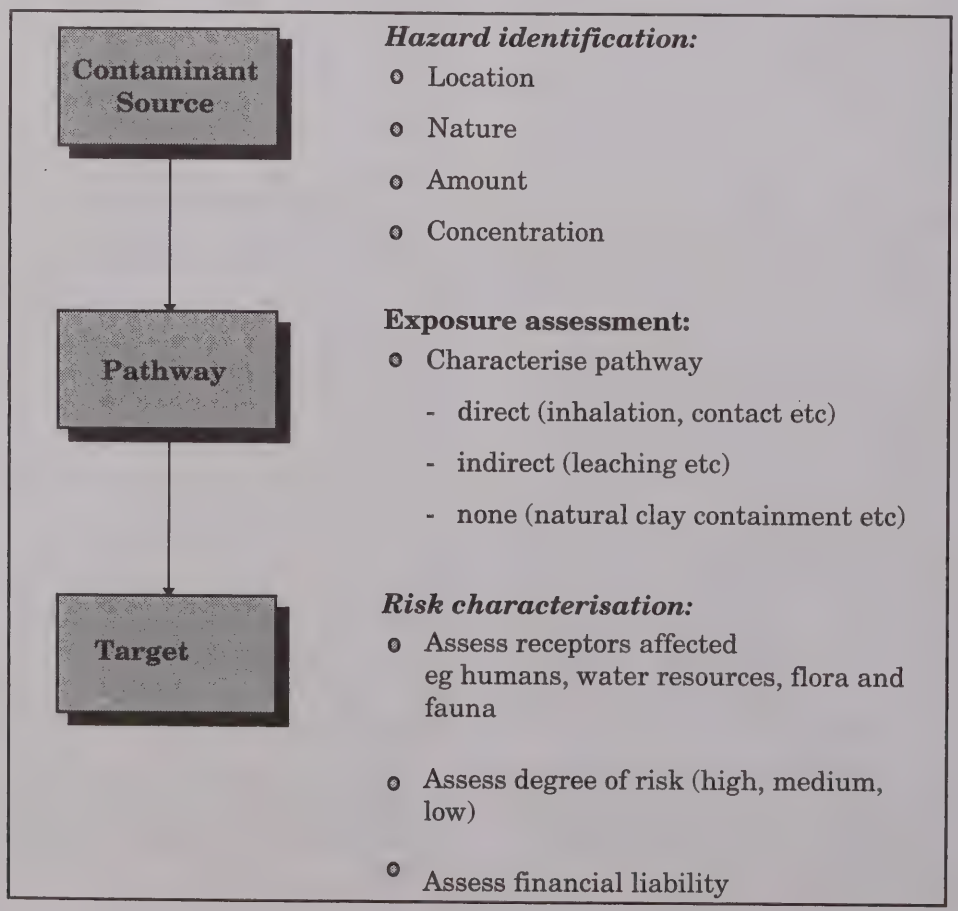
In order to confirm that land is "contaminated", the draft guidance requires that this "pollutant linkage" be demonstrated to exist. For significant harm as defined by the guidance, in the case of humans, contact must result in death, serious injury, cancer or other disease, genetic mutation, birth defects, or the impairment of reproductive functions. Clearly then, low concentrations of hazardous substances would not result in a pollutant linkage causing harm as so defined unless the substance had a low toxicity threshold such as dioxins or asbestos.

In order to establish the basic components of a risk assessment, the traditional process of phased investigation must be undertaken. This could consist of:

- desk study and preliminary qualitative risk assessment;
- intrusive investigation, coupled with monitoring to establish trends in site data;
- risk assessment - either qualitative or, if appropriate, quantitative;
- supplementary investigation to clarify areas of uncertainty.

A quantitative assessment may be considered necessary. Quantitative risk assessment

- is used in situations where hazards are perceived to be high, and damage potentially unacceptable;
- is used for high profile projects where third parties or the public are involved;
- is often thought to provide absolute answers;
- in practice provides risk estimates (for example 1 in 1 million annual probability of death from exposure to contaminant), but subject to large uncertainty ranges;
- requires comprehensive data on the site and its contamination.



3. Risk Management

Having established that a pollutant linkage exists, it is necessary to define remediation measures. This is essentially the risk management stage, where risks identified are controlled by using one or more of the following techniques:

- elimination of the hazard by total removal/treatment;
- control of the hazard by encapsulation or separation;
- interception of pathways for contaminant movement by use of barriers and sealing systems;
- removal or protection of sensitive receptors.

There are three broad categories of remedial methods which may be considered on their own or in combination:

- risk avoidance options;
- engineering options; and
- treatment processes.

Risk avoidance options include changing land use, site layout and location of services and other infra-structure, thus reducing the risks to particular receptors through elimination of the pathway and isolating the receptor. They are not usually feasible where development already exists and are limited to the type of receptor they will protect, e.g. inappropriate for groundwater and off-site migration of gases.

Engineering methods use conventional civil engineering techniques and are used to remove or isolate the sources of contamination or modify the pathway. They broadly comprise:

- excavation;
- in-ground barriers;
- covering and capping systems;
- hydraulic measures such as pumped control of contaminated groundwater; and
- retrospective methods to alleviate the risks to existing buildings.

Treatment processes may be used singly or in combination to destroy or modify the nature and behaviour of contaminants and include:

- thermal processes;
- physical processes, e.g. soil washing;
- chemical processes;
- biological processes, e.g. anaerobic digestion; and
- solidification and stabilisation.

No matter which remediation measures are selected these factors must be taken into account:

- engineering feasibility;
- economics;
- health and safety;
- environmental impact;
- current and future standards/codes of practice;
- legislation.

Engineering feasibility must be considered for any physical solution which is deemed necessary at a contaminated site. This means that the solution must be practical and buildable, and appropriate to the ground conditions.

Economics are fundamental to the progression of a scheme, and having established through the risk assessment that there is a requirement for clean up, then cost must be controlled to ensure that the development scheme can generate sufficient funds to cover the additional reclamation costs. There is a specific requirement in the draft guidance that the cost of remediation at a site should be reasonable.

When designing the clean up strategy, both health and safety and environmental impact issues must be considered such that when a solution is finally chosen, it can be demonstrated to have considered all issues in addition to basic cost. The chosen solution should balance all environmental impacts against cost and final site condition to provide the required reduction in risk, the minimisation of environmental impacts and a reasonable cost. In addition, the *Construction Design and Management (CDM) Regulations 1994* require that hazards to the construction workforce are addressed by the client, the designer and the principal contractor and this is particularly an issue for contaminated land.

Finally the Environment Agency has policy objectives for remediation solutions to be sustainable although the precise meaning of this is currently under development.

4. Whither Now?

The continued commitment to the 'suitable for use' approach to the management of contaminated land forms the basis of the draft guidance and this has been widely supported. Within the guidance, the Government has also reiterated that remediation measures should be both cost-effective and should employ the best practicable techniques. This pragmatic approach to remediation offers a balance between risk management and expenditure of resources.

The new requirements on local authorities for inspection and assessment under the guidance are now recognised to be substantial, requiring significant time, resources and technical expertise in excess of current levels of commitment. Presently, very few local authorities have sufficient expertise in-house and there would appear to be significant financial constraints on their ability to buy in the requisite skills (either permanently or on a consultancy basis).

There are other possible costs to a local authority which must also be taken into account. For example:

- potential costs in defending challenges to any remediation notices;

- where local authorities carry out work in default and are unable to recover the cost because the appropriate person is unable to bear such costs or where the site is an orphan site (i.e. sites which have no owner or occupier or where those otherwise liable are exempted by statute).

In order to enable an appropriate level of commitment to be devoted by local authorities, these authorities must have the resources and training to carry out their required duties or to allow them to appoint appropriately skilled and competent consultants.

The previous Government's view that contaminated land would not be an extra onus on the regulators was based on the grounds that it only amounted to clarification of powers under statutory nuisance legislation. However, both private and public sectors expressed concerns through the consultation process that there had been a failure to recognise the considerable additional demands which the proposed regime would place on local authority resources in particular. The present Government appears to be taking a more realistic stance but it has also promised not to increase public spending above previously planned levels for two years. Given that local authority associations have estimated over £12 million per year set-up costs, and there's a large unknown regarding orphan sites and invocation of "hardship" clauses by liable parties, the new contaminated land regime will now be delayed until at least April 1999.

From our experience, the creation of the interim hiatus has led to inconsistencies in regulators' views of contaminated land redevelopment. A proportion will only discharge their responsibilities within the current system (e.g. by dogmatically applying the existing ICRCL guidance provisions) where they are on familiar territory. However, an increasing number are prepared to adopt the new approach provided that any remediation criteria are justified by a risk assessment (the science of which, it must be noted, may be compromised by third party perception of clean-up standards which appear less stringent than the existing provisions) and assuming that where necessary their budgets allow consultants to augment their resources and expertise. The wish for a level playing field is frequently demanded by the private sector and, given the considerable difference in potential costs involved by each route, this is an instance where it feels fully justified.

Implementing the National Air Quality Strategy Developments in Bristol

David Muir
Bristol City Council

The passing of the Air Quality Regulations 1997 set the clock ticking on assessing air quality, preparing for air quality management and improving air quality. This was paralleled by the passing of the Road Traffic (Vehicle Emissions) (Fixed Penalty) Regulations 1997 which launched a pilot scheme for roadside emission checks to be carried out by seven local authorities (Bristol, Birmingham, Canterbury, Swansea, Middlesbrough, Glasgow and Westminster). This article aims to illustrate the early progress made in these areas in Bristol.

Land Use Planning

The processes involved in improving air quality will inevitably involve many agencies within local government; Environmental Health in assessing air quality and identifying Air Quality Management Areas (AQMAs), Planners and Traffic and Highways Departments in implementing the land use planning and traffic management aspects of delivering improved air quality and other departments in ensuring that their policies and procedures do not undermine these measures. At the NSCA seminar in November 1997 on *Developing a Local Air Quality Strategy* these points were emphasised and re-emphasised by speaker after speaker and the genuine and strong reservations that many felt about the practicalities of achieving this was one of the main points made.

After all this the question remains: is it possible to achieve the desired collaboration. The answer from the Bristol experience is a definite YES. The reasons for this are explained below.

In the very recent past two major developments have been proposed in Bristol. One is a large furniture retailing outlet on the old Eastville football, greyhound and (briefly) speedway stadium site. The second is a new bus depot on disused playing fields in the south of the City. In both cases the planning officers were put in contact with the Environmental Quality Section, the team dealing with air quality in the Health & Environmental Services Directorate, at an early stage and the opportunity to address the air quality issues in both these developments became in integral part of the planning process.

Because of the nature of the two developments different approaches had to be taken in assessing their air quality impacts. In the case of the retail outlet the predominant source of potential increased emissions was likely to be customers' cars, mainly petrol engined vehicles, whereas the main emissions at the bus depot would be from the diesel engined buses.

As a result of this conditions were included in the planning consents to require appropriate monitoring of air quality before and after the completion of the development and requiring remedial measures if there were deteriorations in air quality which could be attributed to the developments. For the retail outlet monitoring for carbon monoxide and oxides of nitrogen was specified for a period of 12 months before the opening of the store (or the longest period possible if 12 months could not be achieved) and for at least 12 months after the opening depending on whether remedial measures were found to be necessary. The criteria for remedial action were threefold:

- five or more exceedances of 150 ppb NO_2 as an hourly average in excess of any exceedances in the number recorded before the opening of the store;
- an increase of 10% or more in the annual average concentration for NO_2;
- five or more exceedances of 10 ppm CO as a running 8 hour average in excess of any exceedances in the number recorded before the opening of the store.

It was felt that it would be inappropriate to specify an exceedance of the annual average NO_2 standard of 21 ppb as, in the absence of specific data, it was believed that this was almost certain to be exceeded at the location where monitoring would take place.

At the bus depot the requirement was for monitoring, again before and after the opening of the depot, for PM_{10} as the main impact was likely to be from diesel emissions. Again remedial measures were required if there was a significant deterioration in air quality after the opening of the depot.

As there is always likely to be some variation, either up or down, on a year to year basis in concentrations of any pollutant it was felt that it was not appropriate, and indeed that it would probably be deemed unreasonable on appeal, to specify that any increase in exceedances of the air quality standards should trigger remedial measures.

Traffic Management

There has been a long history of collaboration in Bristol between the air quality specialists and the traffic specialists on transport policy. This was evident in both the BRITES study which was carried out under the former County of Avon and in the European funded ELGAR project which started under Avon and continued under Bristol after Local Government Reorganisation.

Given the more strategic nature of the transport issues a longer term view was felt to be appropriate. In order to establish the ground rules an informal seminar was organised for senior officers from the Planning, Transport & Development Services Directorate and the air quality specialists in the Health & Environmental Services Directorate. The outcome of this meeting was positive and has resulted in a joint committee report from the two Directorates being prepared with a recommendation that in future one of the standard issues to be considered in all planning applications is the air quality implications. Clearly there will be a large number of small applications, such as house extensions, where there will be no significant air quality implications but for larger developments this is an encouraging move as it will enable greater emphasis to be given to aspects such as green commuter plans for office developments.

Vehicle Emission Testing

The legislation for vehicle emissions testing has attracted some adverse comments, largely because unlike other vehicle defect notices there is no provision for the driver to be required to remedy the defect and produce proof of this. Instead if a vehicle fails the test the driver is issued with a fixed penalty notice for £60 rising to £90 if not paid within 28 days. A driver can elect to have the case heard in a Magistrates Court; if the case is proven the fine and costs can be substantially higher than the £60 fixed penalty. There are provisions for notices to be withdrawn but these are governed by strict criteria.

Because the Bristol residential area is reasonably well defined and covered by the same newspapers, radio and television services it was not felt that there was a need to follow the procedure adopted by Westminster City Council where notices were erected at the Council's boundaries warning of random emissions testing. In Bristol it was felt that adequate "warning" could be achieved by a combination of press releases and use of a trial period of testing in supermarket car parks. In spite of this local people still made claims that they were unaware of the testing programme, usually because they could not be bothered to watch or listen to the programmes or read the paper!

Because there was a lead-in period between the passing of the Regulations and a meeting of the Committee at which the delegation of powers to authorise the testers under the Regulations was agreed, a programme of trials in supermarket car parks was set up. This both provided a means of publicising the fact that emissions testing was coming and the penalties involved, and enabled the testers from the Council's Contract Services to become familiar with the equipment and with working "on the road". This period also allowed negotiations to be made with the police to firstly identify potential sites for testing in different areas of the City and for the provision of police officers to stop vehicles. Sixteen sites were selected for an initial run of testing on Monday, Tuesday and Wednesday. Testing in earnest began on 16 February with a lot of publicity at a site in the central area. The media response was favourable but inevitably the first people to be issued with fixed penalty notices were less pleased.

Up to the end of March 1026 vehicles had been tested and of these 97 (9.5%) were issued with fixed penalty notices and a further 28 warnings were given to drivers of vehicles whose emissions fell between the MoT test limits and the slightly higher figure at which notices are issued. To date four notices have been withdrawn, in some cases because the driver was able to prove that the vehicle had been issued with a new MoT certificate in the previous few days and in one case because, due to the registration mark, it was identified as being fitted with a catalytic converter whereas it was not - this appears to have been a case of old stock remaining in the showroom and being sold under the following year's registration letter.

It was not possible to test four vehicles, the drivers of which were again given a warning that their vehicles needed attention. Of the failures and advisories 52% were using leaded petrol, 26% unleaded petrol and 22% were diesel engined. Two of the cases have been formally challenged but at the time of writing they had not been heard. The first should have been heard in April but was adjourned as the vehicle involved was a van operated by a major company which elected to accept responsibility for the condition of the vehicle whilst challenging the test result; the summons against the driver was therefore withdrawn and served on the company. This illustrates an interesting legal point in that the strict liability for the emissions under law rests with the driver of the vehicle even though the driver may be unaware that the emissions are above the prescribed limits. In this case it was felt that the court would take the view that if the prosecution of the driver were to be pursued it could be viewed as a malicious prosecution and the case could result in an absolute discharge even if the case were proven.

Following the first six weeks of testing in February and March the results were reviewed and the initial sixteen sites were reduced to nine. It had not been possible to carry out tests in the first period at one of the sites so this was retained for evaluation. The remainder were sites where setting up the testing was relatively easy, congestion was minimised and higher proportions of failing vehicles were found.

Conclusions

In the case of the "straight" air quality aspects of the implementation of the *Environment Act 1995* in Bristol it is still early days but the initial signs are encouraging that progress is being made on working together by the two main players, Environmental Health and Planners. There are other groups which need to be brought into the process but it is hoped that, especially with the help of the excellent DETR video, all Directorates will be made aware of the contribution, however small, that their actions and policies can make to improving air quality.

The emissions testing is clearly a case of a steep learning curve. The percentage of vehicles failing the test in Bristol is 10% which is higher than in most of the other authorities involved in the pilot study. It is becoming obvious that there are important lessons to be learnt from the pilot study for the full implementation of local authority testing and that there are likely to be a number of significant changes to the guidance which has been used by the seven pilot authorites.

The views expressed in this paper are purely those of the author and do not necessarily represent the views of Bristol City Council or the Department of the Environment, Transport and the Regions.

First Phase Authorities
Belfast City Council

Heather Armstrong
Belfast City Council

Although the requirements of the Environment Act 1995 to review and assess air quality do not apply to Northern Ireland, Belfast was invited to participate as a first phase pilot authority. Belfast is widely recognised as one of the worst cities in the UK for sulphur dioxide and particulate matter pollution. This was largely attributed to the high dependency on the use of solid fuel for domestic heating and the influence of specific meteorological and topographical factors. The work was funded by the Environment and Heritage Service of the Department of the Environment for Northern Ireland.

Introduction

Belfast was given four specific tasks

1. A fuel usage survey;

2. The determination of PM_{10} emission factors for domestic solid fuel;

3. Modelling of airborne PM_{10} and SO_2 concentrations in Belfast;

4. A comparison of samplers for fine airborne particles (see *Clean Air*, vol. 28, no. 2, and revised version in this issue of *Clean Air*).

1. Fuel Usage Survey

A social survey was conducted to provide data regarding domestic fuel usage. Belfast is now covered by a smoke control programme and information was obtained on the potential upper limit for unauthorised fuel use. Barriers to

change to more environmentally friendly fuels were identified and future fuel use was predicted. The survey was essential to provide data to enable the development of an emissions inventory for domestic heating in order that atmospheric dispersion modelling could be carried out. It also provided an insight into public perceptions of air pollution in the city.

Key findings were:

- solid fuel is used by 23% of households and up to 18% of these may use unauthorised fuels;
- predicted future purchase patterns suggest that consumption levels of unauthorised fuels will remain the same for the next ten years. With regard to the impact of natural gas (which is only now becoming available in Belfast), only 40% of households believe they will have the opportunity to switch to it and of these only 17% feel they would be likely to switch;
- just over 40% believe that air pollution is a problem in Belfast. Vehicle emissions (66%) are perceived to be a much bigger source of air pollution than either burning household fuel (42%) or industrial sources (32%).

2. PM_{10} Emission Factors for Domestic Solid Fuels

This task was designed to provide robust emission factors for PM_{10} arising from the burning of nine popular solid fuels used in the Belfast area. They consisted of four generic types of fuel (bituminous coal, smokeless coal, petroleum coke and petroleum coke blends) and were tested on both an open fire and a glass fronted roomheater. The fuels were also analysed for their % sulphur content in order to calculate a theoretical emission factor for SO_2. The research was conducted by the Coal Research Establishment Group Ltd, Cheltenham and the results are summarised in the table below.

The results show that for all the appliances and configurations tested, 80-96% of the particles emitted during burning were in the PM_{10} range. This illustrates how the burning of solid fuel, and in particular bituminous coal, is a significant source of PM_{10}. For open fires, Household Coal and Texan Star Coal gave the highest PM_{10} emission factors with average values for the full cycle being 9,000 mg Kg^{-1} and 11,000 mg Kg^{-1} respectively. Emission factors for Coalite, Redflame and Calco (smokeless fuels tested on an open fire) gave average values between 880 - 2,300 mg Kg^{-1}.

On closed appliances, Extracite, Burnglow and Premium Esse (smokeless fuels) gave average PM_{10} factors of 1,200, 1,000 and 1,200 mg Kg^{-1} respectively.

With regard to SO_2, the petroleum cokes, e.g. Calco and Budget Blend, were the highest (58g and 32g of SO_2 per Kg of fuel respectively). Bituminous coals were generally in the middle, e.g. Texan Star Coal - 25g of SO_2 per Kg of fuel. Smokeless fuels generally had the lowest emission factors, e.g. Premium Esse - 14g of SO_2 per Kg of fuel; Burnglow - 18g of SO_2 per Kg of fuel.

The derived emission factors were of invaluable assistance in supporting the atmospheric dispersion modelling study project. They will also be of assistance to other local authorities and organisations conducting modelling studies of domestic emissions in areas where solid fuel is burnt.

3. Modelling of Airborne PM_{10} and SO_2 Concentrations in Belfast

In participating as a first phase authority, Belfast focused its review on the impact that the present level of domestic

Average Total Particulate and PM_{10} Emission Factors for a Range of Solid Fuels

Fuel Type	*Appliance Type*	*Total Particulate Factor (mg kg^{-1} fuel)*	*PM_{10} Emission Factor (mg kg^{-1} fuel)*	*% PM_{10} Fraction*
Household Coal (B)	Open	9,500	9,000	95
Texan Star Coal (B)	Open	12,000	11,000	92
Coalite (S)	Open	1,700	1,600	94
Redflame (S)	Open	970	880	91
Calco (SPC)	Open	2,400	2,300	96
Budget Blend (SPC)	Open	3,500	2,800	80
Extracite (S)	Closed	1,300	1,200	92
Burnglow (S)	Closed	1,100	1,000	91
Premium Esse (S)	Closed	1,400	1,200	86
Calco (SPC)	Closed	3,200	2,600	81
Budget Blend (SPC)	Closed	3,500	3,200	91

B = Bituminous Coal
S = Smokeless
SPC = Smokeless Petroleum

solid fuel usage has on existing levels of PM_{10} and SO_2 in the city. In comparison to the rest of the UK, the highest levels of both pollutants generally occur in Belfast. This warranted the undertaking of more sophisticated modelling techniques in order to predict whether Belfast would achieve the Government's air quality standards for these pollutants by 2005.

The contract was awarded to Cambridge Environmental Research Consultants Ltd (CERC) based on the use of ADMS Urban. Our modelling experiences were similar to those reported by other pilot authorities (*Clean Air*, Vol. 28, no. 2). The task of developing emission inventories was found to be onerous and the complex nature of the study presented many problems.

The model was found to be a useful tool in considering the effects of various abatement measures to reduce pollution levels. It was run to estimate pollution levels in 2005 and to consider the impact of the following scenarios:

- high and low uptake of natural gas upon its introduction in Belfast;
- a 15% improvement in energy efficiency in Belfast's buildings;
- zero coal consumption;
- reduced sulphur emissions, due to a ban on the sale of high sulphur smokeless fuels and EU controls on the sulphur content of oil and diesel;
- the closure of Belfast West power station.

For SO_2, modelled mean concentrations were close to observed values at Belfast Centre, but under-predicted at Belfast East. This suggests that the SO_2 emissions are approximately correct in magnitude, but that the spatial distribution of emissions is not precisely described. However, for PM_{10}, the calculated concentrations fell significantly below measurements, both for mean concentrations and the 99th percentile of 24 hourly running means. This suggests that either the emissions are too low or that secondary particles or regional background concentrations are a major influence on PM_{10} in the city.

The model predicts that in 2005 there will continue to be exceedances of the National Air Quality Strategy (NAQS) standards for SO_2 and PM_{10}, even with the proposed abatement measures. The influence of point sources on pollutant concentrations was found to be small compared to the influence of domestic and vehicular emissions. For SO_2, domestic emissions were identified as the dominant contributor. However, for PM_{10} road sources may be as important as domestic emissions.

As a consequence of the pilot study, Belfast City Council has obtained a licence to operate ADMS Urban. This is enabling further development and refinement of the model, particularly regarding inaccuracies identified in the emissions inventory.

General Conclusion

Participation in the pilot tasks provided an opportunity to improve our knowledge and understanding of key pollutants in the city. However, it also highlighted specific problems unique to Northern Ireland councils involved in air quality work. Councils have no responsibility to monitor, let alone manage, air quality. No new controls are available for councils to tackle air pollution problems. The responsibility for planning and transportation within Northern Ireland also differs from that in the rest of the UK and this creates problems in developing an intersectoral approach.

Belfast is in the unenviable position of knowing it is unlikely to meet the standards in the NAQS for SO_2 and PM_{10} by 2005 (even with a range of remedial measures), yet the framework legislation does not exist and air quality management areas cannot be introduced.

Further Information

Heather Armstrong or Ivan Gregg, Belfast City Council, Health and Environmental Services Department, The Cecil Ward Building, 4-10 Linenhall Street, Belfast BT2 8BP. Tel: 01232 320202.

CORRECTION

Belfast
Comparison of Samplers for PM_{10}

Duncan P.H. Laxen
Air Quality Consultants

A comparison between co-located TEOM and Partisol PM_{10} samplers has been carried out over a three and a half month period (January - April 1997) in the centre of Belfast. Consideration has also been given to the use of Black Smoke as a surrogate for PM_{10}. The results show the TEOM under-reads against the Partisol, especially at higher concentrations, with considerable day-to-day disagreements. The Partisol generated 21 exceedances of the 50 µg/m³ standard, whereas the TEOM produced four exceedances. This has implications for checking compliance with the new National Air Quality Strategy standards and objectives. Black Smoke concentrations are, on average, below those of the TEOM, with better agreement at higher concentrations. The findings of this study are in line with those from elsewhere and suggest considerable caution should be exercised in handling results produced by different methods.

Introduction

The March/April 1998 issue of *Clean Air* carried a paper reporting the relationship between PM_{10} concentrations measured using a TEOM and a Partisol, and the relationship between TEOM and Black Smoke results (Vol.28, No. 2, 44-47). It has since come to light that the TEOM data were substantially in error during this period. The exact nature of the relationship between the TEOM, as used in the Department of the Environment, Transport and the Regions (DETR) national network, and gravimetric samplers is crucial for those wishing to use the latter to monitor in relation to the national air quality standards and objectives. For instance, the DETR has recently recommended that the national standard effectively be changed from 50 µg/m³ to 65 µg/m³ when evaluating measurements made using gravimetric samplers[1]. Given the importance of the subject, NSCA has agreed to re-issue the results of the Belfast study based on the corrected TEOM results. The background to the study and the methods employed are described in the original paper, and will not be repeated here, other than to note that the analysis is based on matched time periods of around 24 hours.

Results

There is poor agreement between the Partisol and the TEOM, both overall, with mean concentrations for the full three and a half months of 34.2 µg/m³ for the Partisol and 22.8 µg/m³ for the TEOM, and on a day to day basis, especially at the higher concentrations (Figure 1). The majority of the Partisol concentrations are above those of the TEOM. The Black Smoke method, on the other hand, generally produces concentrations below those measured using the TEOM, especially at the lower concentrations. The Black Smoke mean for the full period is 15.8 µg/m³, against 23.4 µg/m³ for the TEOM.

A more detailed analysis of the agreement/disagreement between samplers is presented in Figures 3a-d, where the difference between the pairs of time matched samples are plotted against the average for that pair. One set of plots (a & c) is for the absolute difference in microgrammes per cubic metre (µg/m³), the other (b & d) is for the relative difference (difference as a percentage of the mean).

The TEOM clearly under-reads against the Partisol, particularly at higher concentrations, both in absolute and relative terms (Figure 3a & b). This has implications for the number of exceedances of a daily concentration of 50 µg/m³. During the three and a half months there were 21 daily exceedances of 50 µg/m³ for the Partisol and 4 for the TEOM. This tendency for the TEOM to under-read against the Partisol, particularly at high concentrations, is also seen in the results of a study in the London Borough of Greenwich[2]. The same pattern is found in data collected in California, where the TEOM was compared with a High-Volume sampler[3]. In the latter study, seasonal differences were also found in the relationship between samplers.

Another feature of the results is that the variability of the differences between Partisol and TEOM tends to increase both in an absolute sense with increasing concentration (Figure 3a), and in relative terms (Figure 3b). At an average concentration of 20 µg/m³ the Partisol is around 3 µg/m³ higher than the TEOM (range roughly 0-10 µg/m³), while at an average concentration of around 50 µg/m³ the Partisol is around 25 µg/m³ higher than the TEOM (range roughly 0-70 µg/m³). These differences are sizeable and demonstrate poor agreement between the Partisol and TEOM results on a daily basis at higher concentrations. This finding has important implications for the use of daily PM_{10} data in epidemiological studies, as the definition of high PM_{10} days for comparison with health statistics will depend on the sampler used.

The differences between Black Smoke and TEOM results demonstrate the negative bias of the Black Smoke method as against the TEOM at lower concentrations (Figure 3c & d). However at higher concentrations the disagreement is less significant (or the agreement is better) in both relative and absolute terms. There is some evidence that the Black Smoke method may over-read against the TEOM at higher concentrations. These results show that there is poor agreement between the Black Smoke and TEOM results both on average and on a daily basis. Similar findings have arisen in other studies, which have shown

that the difference between samplers varies from location to location and also from summer to winter[4,5].

Conclusions

- The Partisol produces higher concentrations than the TEOM, with means of 34.2 and 22.8 µg/m³ respectively for a winter period in Belfast.
- The Partisol and TEOM are in reasonable agreement at lower concentrations, <30 µg/m³; however, at higher concentrations the agreement is poor in both absolute and relative terms. This is particularly significant when counting exceedances of a 24-hour concentration of 50 µg/m³. During the sample period there were 21 daily exceedances of 50 µg/m³ for the Partisol and 4 for the TEOM. To be comparable in terms of number of exceedances, the equivalent standard for the Partisol would have to be set at 75 µg/m³.
- The Partisol cannot be considered to be a good indicator of TEOM concentrations on a day-to-day basis. Similarly, the TEOM cannot be considered to be a good indicator of Partisol concentrations on a day-to-day basis. There are clear risks in using the two methods interchangeably. The UK has de-facto adopted the TEOM as the standard PM_{10} sampler, because at the time of its introduction it was the only instrument available offering 1-hour time resolution, as well as having other advantages over manual methods. It remains to be seen whether the TEOM is acceptable in relation to the proposed new EU Directive. This uses a high volume gravimetric sampler as the reference method, which is likely to be closer to the Partisol in performance than the TEOM.
- The present results are consistent with those of other studies. Under-reading of the TEOM against the gravimetric methods is attributed to the loss of volatile nitrates and VOCs at the higher temperature at which the TEOM filter is held (50°C). These other studies also suggest a seasonal pattern to the relationship, which cautions against extrapolating the Belfast winter results to the full year.
- The Black Smoke sampler generally gives concentrations lower than those produced by the TEOM, although the agreement is better at higher concentrations. Separate studies have shown that the TEOM : Black Smoke relationship is variable from site to site and differs from summer to winter. This would suggest that Black Smoke measurements are unlikely to be very helpful for local authorities reviewing air quality in relation to the NAQS PM_{10} standard and objective.
- The results of this study demonstrate that caution should be exercised in handling results obtained using different PM_{10} samplers. Further work is clearly required before unambiguous advice can be given as to which samplers are suitable for measurement of PM_{10}, or whether there is any sound basis for correcting gravimetric results to equivalent TEOM results, or vice versa.

Acknowledgements

This work was supported by funding from the Environment and Heritage Service, Department of the Environment, Northern Ireland.

The author would like to acknowledge the work of Damien Martin and Heather Armstrong of the Health and Environmental Services Department, Belfast City Council, who coordinated the project.

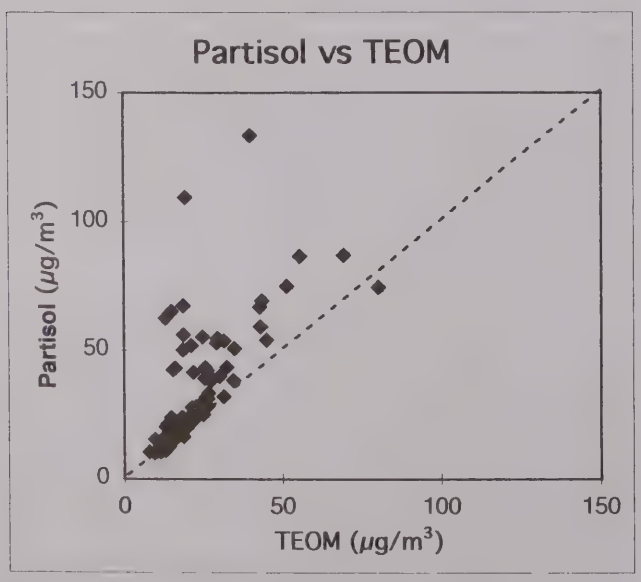


Figure 1 Daily Partisol Against TEOM
Also shown is 1:1 line

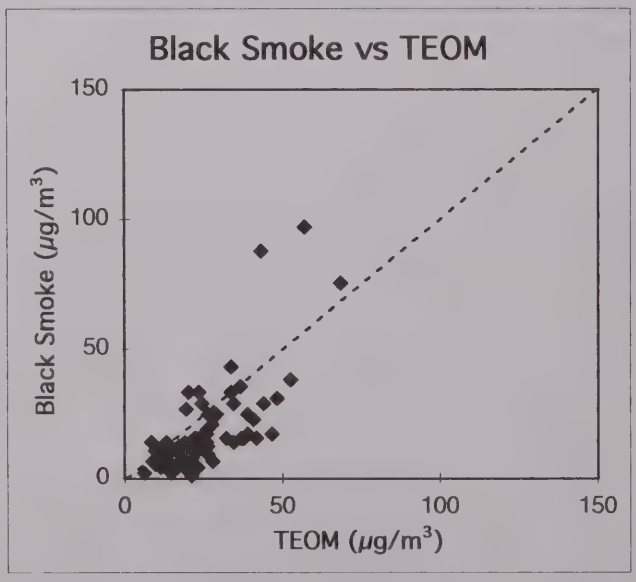


Figure 2 Daily Black Smoke Against TEOM
Also shown is 1:1 line

The views expressed are those of the author and not necessarily those of any other organisation.

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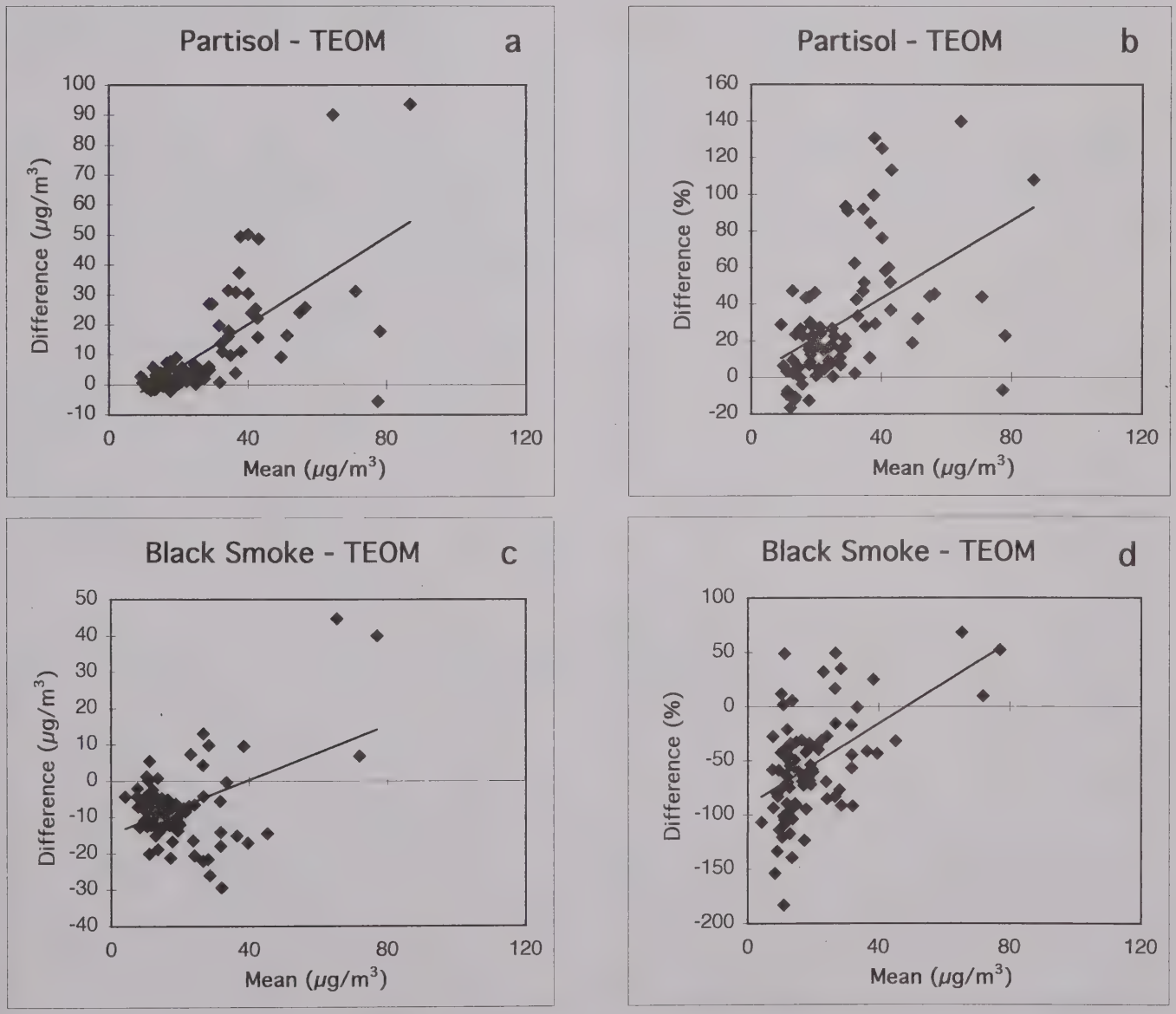

Figure 3 a-d Absolute and Relative Differences Between Samplers Plotted Against Mean Concentration. Also shown are best fit regression lines.

UPDATE

NEW POLLUTION CONTROL LEGISLATION FOR NORTHERN IRELAND

A new pollution control regime is now being implemented in Northern Ireland following adoption of the *Industrial Pollution Control (Northern Ireland) Order 1997* on 26 November 1997. The Order introduces a three tier system of industrial pollution control:

- Integrated central control - Part A processes, i.e. those with high pollution potential to be regulated for Integrated Pollution Control by the Department of the Environment, Northern Ireland;
- Restricted central control - Part B processes, i.e. those with the potential to cause serious air pollution; these are also to be regulated by the DOE(NI);
- Local control - Part C processes, i.e. those with significant but less potential for air pollution; these will be regulated for air pollution by district councils.

Two sets of Regulations were brought into force on 2 March 1998 - *The Industrial Pollution Control (Prescribed Processes and Substances) Regulations (Northern Ireland)* and *The Industrial Pollution Control (Applications, Appeals and Registers) Regulations (Northern Ireland).* These are similar to the Regulations applying in England, Scotland and Wales, with new processes required to apply for an authorisation immediately. Existing processes are being brought within the new regime over the next four years, with the final tranche of applications for authorisation to be submitted by 31 December 2002.

KYOTO PROTOCOL

The UK, together with the other Member States of the European Community, and the EC itself, signed the Kyoto Protocol in New York on 29 April. The main greenhouse gas producers - the USA and Russia have yet to do so. As of 29 April, 34 countries had signed the Protocol - 55 signatures, representing 55% of global carbon dioxide emissions, are required before the Protocol can come into force.

The Protocol will commit industrialised countries to a 5.2% reduction in greenhouse gas emissions based on 1990 levels to be achieved by 2008, with individual signatories required to meet differing targets. The European Union's target is 8%; the Member States will need to agree individual targets which will together meet the EU's target.

EPAQS AND LEAD

The Expert Panel on Air Quality Standards has recommended an air quality standard for lead of 0.25 mg/m^3 measured as an annual average. This standard will be considered during the Government's current review of the National Air Quality Strategy which currently includes the WHO recommendation of 0.5 mg/m^3 measured as an annual average. EPAQS has based its recommendation on the fact that while it is agreed that exposure of young children to lead can impair brain development as reflected by a reduction in IQ, it has been unable to identify a clear threshold for this effect; the EPAQS standard thus reflects available evidence and the use of safety factors to ensure that reductions in IQ of one point or more would be unlikely to occur.

The EPAQS report, *Lead*, is available from the Stationery Office, £7.99.

NO_2 SURVEY

Results from the fourth annual (1996) nitrogen dioxide diffusion tube survey show that annual average concentrations have remained broadly consistent with those measured between 1993 - 1995. During 1996 annual average concentrations were 24 ppb at kerbside sites, 17 ppb at intermediate sites and 14 ppb at urban background sites. Concentrations of more than 40 ppb were recorded at seven kerbside sites but at none at any of the other sites. One hundred and seventy-eight kerbside sites, 52 intermediate sites and 31 urban background sites recorded concentrations of more than 21 ppb - the national air quality standard to be achieved by 2005.

This survey is carried out by the National Environmental Technology Centre as part of the DETR's air quality research programme.

AIRCRAFT EMISSIONS

The European Commission has published a draft Directive limiting emissions of oxides of nitrogen from civil subsonic jet aeroplanes. Action to control NOx emissions is needed because although aircraft are thought to be responsible for only about 3% of manmade NOx, they are the only source in the upper troposphere and lower stratosphere, and thus they have a disproportionate effect on ozone formation. The Commission also feels that action is needed now given the forecast increase of about 6% per annum in air transport movements to 2010. The Directive will require individual aircraft to meet standards which reduce NOx emissions by 33% compared to 1986 standards.

RADON INFORMATION

The National Radiological Protection Board (NRPB) has launched a new service providing individual reports on the radon potential of homes. The service has been developed

in response to demand from solicitors and others who wish to confirm whether a property is in a radon Affected Area - a question often raised during house conveyancing. Initially the service will cover the whole of England and be based on published data.

The cost of the service is £18.45 plus VAT for which a written report will be issued with information on the results of radon measurements, both within the local authority area and the immediate locality of the property; an estimation of the probability of elevated levels of radon within the property will also be given but not actual measurement data.

In order to keep costs low and to provide a rapid service (it is hoped to despatch reports within five working days of a request being received), cheques should accompany the search request.

For further information about the service, telephone the Radon Survey on 01235 822622; Email: radon@nrpb.ork.uk

TRAVELLING FREE

... in the Belgian city of Hasselt in Flanders.

Faced with crippling debts, and plans for a new road scheme (to alleviate congestion on the city's existing ring roads) which it could not only not afford but which would also cause immense environmental damage, the city authorities decided on a new approach to their problem - a free public transport programme costing about Bfr 38 million (1% of the municipality's budget).

Launched in 1995, free buses circulate on a 15 minute cycle so that travellers from other cities can either pass around the city on the outer ring or use the free parking spaces and the bus services. The money saved is being split between paying back the city's debts and investing in new projects. The programme also includes a campaign to encourage cycling and there is a further scheme to re-green the city.

Since the scheme started, the use of public transport has risen a massive 857%, while over the same period traffic in the city has fallen significantly.

For more details contact Mark Verachderd, Coordinator, Public Transport, Hasselt. Tel: +32 11 239 023; Fax: +32 11 228 894. (Source: *Hotspot*, Climate Network Europe, April 1998)

MEMBERS' NEWS

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

Latest results from the London-wide Environmental Programme run by **Stanger Science and Environment** suggest that air quality objectives for nitrogen dioxide are being exceeded at 85% of kerbside and roadside monitoring sites. According to technical director Steve Moorcroft, the trend is for air pollution to be levelling out in the capital, but at a level above the objectives of the National Air Quality Strategy. Stanger's work with London boroughs also covers tree health, radiation and noise and vibration.

Westminster City Council has awarded 350 Green Pennants to cleaner vehicles operating in the borough. Under the scheme, vehicles fuelled by electricity, natural gas, liquefied gas, or diesel vehicles fitted with an oxidising catalyst or particle trap, are given a badge in recognition of their contribution to improving air quality. Forty-eight of **London Transport Buses'** Routemaster fleet have been awarded pennants. Information on the scheme is available on 0171 641 1212. Practising what they preach, Westminster CC has recently taken delivery of a diesel/electric refuse collection vehicle, which they are going to try out for six months (see photo)

(Photo credit: Jess Esposito)

The **Met Office** has introduced an improved weather forecasting system using the UK's biggest supercomputer based at their HQ in Bracknell. The new system samples the world's weather at 60km points around the globe, and will be able to provide more accurate forecasts more quickly.

CRE Group will be running another four training courses on gaseous and particulate monitoring this year. They are particularly suitable for environmental managers, process operators and engineers. Details on 01242 673361.

Camden Council has launched a rolling programme of replacing diesel vehicles with LPG vans and electric cars. The fleet already comprises 23 alternative fuelled vehicles, with another 15 due to be added next year. Our picture shows a school meal delivery van being refuelled with LPG.

Croydon Borough Council's residents can now keep abreast of current and past local air quality on the Borough's environmental information register on its website - http:\\www.croydon.gov.uk. Information has been available on the Council's website since 1997 but now users can also access a weekly bulletin of local air pollution levels. Data can even be obtained for pollution levels at a specific hour on a given day. The website is being developed to include information on drinking water, noise pollution issues and a register of authorised processes in the Borough.

Elsewhere:

In a recent parliamentary question, Llew Smith MP asked **Tony Blair** what assessment he had made of the advantages of using photovoltaic solar energy to power the lights on the Christmas tree in Downing Street. The Prime Minister responded: "I have not made an assessment, nor am I aware of having received any representations on the

subject. However, as my Hon. Friend may be aware, photovoltaics are at their least effective during the short winter days and power is needed at night when the panels would not work". He has a point.

NSCA is not the only 100-year old organisation to have enjoyed a number of name changes during its history. The latest draft of the Code of Practice on Noise from Clay Target Shooting yields the information that the Clay Pigeon Shooting Association was formed in 1892 with a catchy title: the **Inanimate Bird Shooting Association**.

Any local authority LAPC officers still struggling with process guidance notes for Part B processes can no longer rely on the DETR's legendary agony uncles, **Smith and Megainey**. A stern note from the Department says: "Technical queries should be raised with Simon Smith and Chris Megainey only when other avenues have been exhausted. These include the use of the link authority networks, contacts within regional pollution groupings...it should normally only be necessary to contact [them] over new or complex technical issues and only after the relevant Process and General Guidance has been consulted".

Finally, all the way from Brussels comes a small pack of information cards on waste and packaging issues produced by the **Alliance for Beverage Cartons and the Environment**. "Welcome to the world of packaging facts" says the introductory card. The pack arrives inside a milk carton, which is itself contained in a large cardboard drum, with plastic ends and stuffed with polystyrene granules. Over 230g of packaging for something that would have easily gone in a 20g paper envelope.

FUTURE EVENTS

8 JULY - Particulate Aerosols Conference
This conference will bring together leading experts on the physical, chemical and bio-pathological properties of particulate aerosols to discuss current state of knowledge and set in the framework of planned future policy.
Venue: Novotel, Hammersmith, London W6.
Details: Rebecca Morden, Royal Microscopical Society. Fax: 01865 791237. Email: meetings@rms.org.uk

20-21 JULY - IT and the Environment
Information technology is critical in obtaining necessary decision making data and for gaining international standards; this conference looks at IT and its role in providing information, modelling, monitoring and control, environmental management systems, waste and geographical information systems.
Venue: Holiday Inn, Crown Plaza, Birmingham.
Details: Christiana Sztadhaus, IBC Conferences. Tel: 0171 453 5491; Email: cust.serv@ibcuk.co.uk

31 AUGUST - 2 SEPTEMBER - Urban Transport & the Environment for the 21st Century
Fourth international conference providing an opportunity for the exchange of information among all those working on urban transport studies and those involved with transport policy.
Venue: Lisbon, Portugal.
Details: Wessex Institute of Technology. Tel: 01703 293223; Email: Paula@wessex.ac.uk

13-18 SEPTEMBER - 11th World Clean Air & Environment Congress
The contribution of developing countries to regional and global air pollution is likely to become increasingly significant; while developing countries may take note of environmental management and technology of developed countries, it is important for them to maintain sustainable development. However, the interface between developing and developed countries must bring about the evolution of appropriate international environmental management.
Convened by the International Union of Air Pollution Prevention and Environmental Protection Associations (for which NSCA provides the secretariat), and hosted by the National Association for Clean Air, South Africa.
Venue: Durban, South Africa.
Details: Ammie Wissing, PO Box 36782, Menlo Park, 0102 South Africa. Fax: +27 12 348 1563. Email: wissing@iafrica.com

15-18 SEPTEMBER - Environmental Health Congress & Exhibition
Annual CIEH congress with strategic plenary sessions and technical parallel sessions encompassing all aspects of environmental health.
Venue: Harrogate International Centre.
Details: CIEH Events Division. Fax: 0171 827 5868. Email: events@cieh.org.uk

29 SEPTEMBER - The Environmental Impact Assessment Directive
Held in Association with the Institute of Environmental Assessment, this conference looks at the requirements of the Directive, who it affects and how to deal with the changes.
Venue: Radisson Portman Hotel, London W1.
Details: Sarah Louise Ashmore, IBC UK Conferences, Fax: 0171 453 5476.

8-9 OCTOBER - UK & European Legislation on Air Quality
This conference will look at national and European air regulations, meeting the requirements of the NAQS, EU air quality Directives, providing essential insight from UK and European regulators, local authorities and the power and transport industries.
Venue: The Berners Hotel, London.
Details: Sarah Louise Ashmore, IBC UK Conferences, Fax: 0171 453 5476.

29-30 OCTOBER - Air Transport Infrastructure & the Environment
What is the real economic and environmental impact of air transport - airlines, airports, manufacturing and maintenance - on the environment and how can balance be achieved and maintained?
Venue: The Radisson/SAS Portman Hotel, London.
Details: Clive Rigden, Aeronautica Communications. Fax: 0181 893 3796. Email: info@aeronautica.co.uk

FORTHCOMING NSCA EVENTS

Tuesday 15 September 1998
Training Seminar - NEC Birmingham
Noise Update 98

Monday 26 - Thursday 29 October 1998
Annual Conference and Exhibition - Weston-super-Mare
Environmental Protection 98

Tuesday 10 November 1998
Training Seminar - NEC Birmingham

Thursday 16 November 1998
Workshop - London
UK Dispersion Model Users Group

Thursday 10 December 1998
London
NSCA Centenary Conference and Reception

Divisional Meetings

East Midlands
17 September: Severn Trent Water, Cropston Visitors Centre

Wales
18 September: Council Meeting
16 October: AGM
27 November: Council Meetings
All venues to be confirmed

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 Fax: 01273 735802

nsca

CLEAN AIR
AND ENVIRONMENTAL PROTECTION

September/October 1998

- NSCA - Noise Survey 1998
- Urban Emissions Inventories
- Indicators for Air Quality & Sustainable Development
- Aggregated UK Air Pollution Indicators
- Hampshire's School Transport Awareness Programme

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CONTENTS

The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

NATIONAL SOCIETY FOR CLEAN AIR AND ENVIRONMENTAL PROTECTION
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EDITORIAL

Local Air Quality Management
The Time for Action

Local air quality management is reaching a crucial phase. In the three years since the Environment Act received Royal Assent there has been a great deal of preparatory activity, from the selection of "first phase" local authorities to the production of guidance notes. Following the recent round of regional training events and with the publication of the last guidance note, the Pollution Specific Guidance, imminent, the work must now begin in earnest.

Most local authorities have already begun, and are probably well into, stage one of the Review and Assessment process, the initial information gathering stage where a list of the most likely sources of air pollution is collated. The expectation of the Government is that stage one will be completed by the end of the year and for the majority of authorities, this should not present a major problem. However, moving into stages two and three will require some important decisions to be taken, decisions which demand a level of strategic thought.

An aspect of review and assessment which has received much attention is air quality modelling. With the current availability of Government funding for capital purchases the temptation for local authorities is to go for the most sophisticated and, therefore, expensive models which have the capability to model on a regional scale and including a wide variety of source types. However, such modelling systems, by virtue of their complexity, often require highly detailed data in order to produce results, data which must be collected and input by officers whose time is already precious.

If these data are not available then the accuracy of the results can be highly suspect and, as Dr Yasmin Vawda's paper on emission inventories and dispersion modelling (this issue) points out, the effort needed to obtain the correct level of detail can be surprisingly large. Local authorities need therefore to consider carefully their requirements before passing over simpler, and cheaper, models which, for small numbers of sources, may well produce results of a comparable level of accuracy in a fraction of the time and for a fraction of the effort.

A strategic approach is central to the entire system of local air quality management. Consultation for local air quality management is an area in which a coherent strategy is vital for success and to avoid misdirected effort. The development of partnerships to pool available expertise should be undertaken at the earliest possible stage and these partnerships should include a wide range of organisations and professions. Many of the large industrial interests are keen to get involved in local air quality management and have a lot to offer beyond simply providing emissions data.

This issue also contains a paper on the principles of consultation which was presented to the Air Quality Forum in July. The NSCA recognises that there is a need for a guide to good practice in this area and the paper is intended to open the debate as to exactly what this is and where it can be found. Time is short, but if we are to achieve the air quality standards we need to get the process right and ensure that it is carried through correctly. Putting in some strategic thinking now could save a great deal of time in the future.

NSCA NEWS & VIEWS

NSCA Noise Survey 1998

The NSCA National Noise Committee is the only independent multidisciplinary non-government organisation working on noise policy. Since the inception of the Noise Bill NSCA has surveyed[1] the local authority officers who enforce noise legislation to gauge their opinions on existing and new law, the extent of the noise problem in the UK and future policy priorities. This survey was sent to Chief Environmental Health Officers in May 1998 and asked for their opinion on noise issues over the preceding year. This is a summary of the results for England, Wales and Northern Ireland[2]. A separate survey was undertaken for Scotland[3], as the Noise Act 1996 does not apply there.

Overview

- Complaints to local authorities about noise from amplified music, dogs, pubs and clubs are still increasing.
- Local authority officers believe that a higher expectation of quiet and incompatible lifestyles with neighbours are largely responsible for increased noise complaints.
- Responding authorities report a four fold increase in complaints from car and burglar alarms.
- Only eight of the responding local authorities have implemented the night time noise provisions of the *Noise Act* - half as many as expressed their intention to adopt them last year.
- Two-thirds of responding local authority officers believe that better education on noise issues is needed to tackle noise problems. Only a quarter believe more prescriptive legislation will help.

Main Findings of the Noise Survey

Major Sources of Complaint About Noise Nuisance

Neighbour Noise - Amplified music is the major source of complaint for 62% of respondents and second most common for 29%. Barking dogs are the most common source of complaint for 28% and second most common source for 46%. In 1991 the Building Research Establishment's Noise Attitude Survey found that people were more likely to complain to the noise maker about amplified sound rather than to the local authority or police.

In the light of comments by EHOs on lack of tolerance and community, it would be worth further investigating whether the public are now more likely to complain to the authorities rather than ask their neighbours to turn down the volume of their music.

Other Sources - Pubs and clubs are the major source of complaint for 48% of responding authorities and second most common for 30%. This was followed by industry which is the most common source of complaint for 29%. In 1997 38% gave industry as the major source - so there has been a significant drop. Complaints about construction sites have risen - in 1997 only 4% cited them as the second most common source of complaint - this year sees a five fold increase to 22%. Traffic is the most prevalent source of environmental noise - however it is also one of the least complained about. Only eight authorities (3%) gave this as their most common source of complaint and there were no obvious similarities between them. A total of 33% of authorities received complaints about burglar and car alarms - compared with only 8% in 1997.

➔ *Complaints about amplified music and dogs are still increasing. There has been a four fold increase in complaints about intruder and car alarms. Complaints about construction noise have risen, while complaints about industry have fallen.*

Change in the Number of Noise Complaints Over the Last Year

Neighbour Noise - According to 68% of respondents complaints about amplified music have increased, 67% reporting an increase in complaints about dogs. Complaints about general domestic noise remained at a steady level for the majority of authorities - last year a greater proportion reported increases.

Other Sources - For 64% of authorities complaints about pubs and clubs are increasing - 8% less than in 1997. 41% report increasing complaints about industry and 43%

increasing complaints about construction - little change from last year.

➔ *Over half of the local authorities responding are still experiencing an increase in complaints about amplified music and dogs. Complaints about general domestic noise have levelled off. There is little change in levels of complaints about industry.*

Responding to Noise Complaints

There is a wide diversity in the way in which local authorities use staff to deal with noise complaints. Only 18% of responding authorities have dedicated noise officers, and there does not appear to be any significant relationship between the types of authority who employ specialist staff. The majority have a small team dealing with night time noise complaints alongside other duties. 14% of responding authorities had no staff dealing with night time noise. Again, there appears little correlation between authorities.

Of the respondents, 42% have officers on duty at specified times to respond to night time noise, 81% provide some form of night time service and a quarter provide 7 day 24 hour cover - these range from rural districts to urban areas. 37% gave inadequate resources as a reason for lack of out of hours service; 17% were satisfied that complaints could be dealt with in normal office hours.

➔ *There is a wide diversity in the levels of night time noise service provided by local authorities. This does not appear to correlate to the geographical/social characteristics of the authorities.*

Noise Act 1996

Only eight of the responding local authorities have implemented the night time noise provisions of the *Noise Act*. Last year 17 expressed their intention to adopt them. There was only one reported instance of it being used. Currently five authorities say they are likely to adopt it compared to eight last year. The main reasons for not adopting the Act were lack of staff/resources and existing legislation considered adequate. Half of the responding authorities had used the powers of confiscation under the EPA, clarified in the *Noise Act*; a further 43% would use them if necessary.

➔ *The majority of local authorities are content to use their own systems for dealing with night time noise nuisance. They are happy with the powers of confiscation.*

Why Are Noise Complaints Still Rising?

The majority - 85% - thought that higher expectation of quiet and incompatible lifestyles with neighbours (76%) were the main reasons for increasing noise complaints. These reasons outweighed inadequate sound insulation and more powerful sound equipment - with just over half of the respondents citing these as a significant factor. 80% said that the public have unrealistic expectations about noise levels, and a number feel that lack of tolerance and general lack of community contribute to escalating noise complaints.

➔ *Social and lifestyle factors are thought to be the major reasons for increasing complaints rather than the ability to make more noise.*

Future Noise Policy

Only 18% of responding authorities think that nuisance has become an inappropriate standard to use in noise cases. However, a number said that it is often difficult to obtain evidence to prosecute. Three-quarters think better education on noise issues is the way forward. Two-thirds favour informal resolution. Only a quarter of the authorities surveyed think that more prescriptive noise levels are the answer.

➔ *Three-quarters of responding local authority officers believe that better education on noise issues is needed to tackle noise problems. Only a quarter believe more prescriptive legislation will help.*

References

1. NSCA Senior Officers "Straw Poll" on the Noise Bill, 7 February 1996.
   NSCA Noise Survey 1997.
2. NSCA Noise Survey 1998, available from NSCA.
3. NSCA Noise Survey, Scotland, 1998, available on request.

NATIONAL NOISE AWARENESS DAY

More than 140 local authorities all over the UK took part in this year's National Noise Awareness Day (NAD) on 1 July. A number of authorities involved schools in initiatives and publicised noise issues of local concern. On the day, a statement of support was issued by Environment Minister Angela Eagle; the Noise Network ran a telephone hotline; and the Health and Safety Executive took the opportunity to draw attention to noise in the workplace. NSCA's own contribution to the day - the publication of the results of its annual noise survey - is reported above. Extensive coverage of NAD on local radio and local press ensured that the message of noise awareness was widely received.

Local Air Quality Management: Review and Assessment Pollutant Specific Guidance

Response to DETR Consultation Paper, issued March 1998

1. Introduction

1.1 The NSCA welcomes this opportunity to contribute to the process of developing guidance which is crucial to Local Air Quality Review and Assessment and, therefore, to the system of Local Air Quality Management. The NSCA fully appreciates the problems associated with writing guidance which is, by its very nature, highly technical and complex but which deals with an area which is still under development.

1.2 While the guidance note LAQM.G1(97) Framework for Review and Assessment of Air Quality provided a structure within which Review and Assessment can take place, this guidance provides the specific process and the tools needed to carry out the task. It is, therefore, the most important in terms of getting the system of local air quality management, as laid down in Part IV of the *Environment Act 1995*, underway.

1.3 Section 88(2) of the *Environment Act 1995* states that local authorities must have regard to any guidance issued by the Secretary of State when carrying out their functions with respect to review and assessment. In addition, this is a new concept and a new process and so local authorities will be extremely reluctant to depart from this guidance. There will be occasions in the future when decisions made by local authorities, and the guidance from which that decision was derived, will be tested in the public arena, for example in a public or planning enquiry, judicial review, etc. In these situations it is obviously vital that the guidance stands up to both legal and scientific scrutiny and that local authorities can rely on it when making those decisions in the first instance.

1.4 It is the opinion of the NSCA that, as it stands, it is unlikely that the guidance would achieve this objective. While this is, to a certain extent, to be expected in a consultation draft, the urgent need for this guidance means that a final, robust version will need to be produced soon while also achieving consensus on its technical content. This is a difficult but necessary task and some consideration should be given to alternative strategies for achieving its completion.

1.5 This paper will look first at some of the more general topics relating to the consultation paper, including its structure and pitch, before moving on to more specific issues. The paper draws on, and in some cases includes, concerns expressed by individual members of the NSCA's Air Quality Management Committee, which may also have been submitted directly to the Department by those individuals on behalf of their own organisations.

2. General Comments

Structure

2.1 Currently, the guidance is arranged in roughly two sections, the first containing a chapter on each of the pollutants of concern and the second dealing with the Stage 3 assessment for all seven pollutants together. Each of the chapters in the first section covers both the Stage 1 and Stage 2 review for that pollutant.

2.2 The process by which a Stage 1 review and assessment is carried out appears to vary little between the pollutants. Each consists of a simple information gathering exercise followed by a set of "filters" which indicate whether further work is necessary for this pollutant, i.e. whether one should stop here or move on to the more complex Stage 2 or Stage 3 assessments.

2.3 The areas of commonality between the pollutants are such that essentially the same information is required for each which inevitably results in a great deal of repetition within the document. Such repetition detracts from the readability and, ultimately, the useability of the guidance. In addition, the fact that so much of the Stage 1 guidance is identical means that the differences are not always easily identifiable, which could lead to confusion on the part of the user.

2.4 It is suggested that the guidance for Stage 1 review and assessment is lifted out of the pollutant specific chapters and amalgamated into a single, separate chapter. This chapter would contain a list of all the information which must be collated for Stage 1, followed by a table showing the factors which would lead to the second or third stages and for which pollutants. This approach would have the advantage of simplifying the process and directly illustrating the differences between the seven pollutants, as well as significantly shortening the document and making it easier to use.

2.5 Whereas the guidance on Stage 1 is largely common for all seven pollutants, for Stage 2, while some areas of commonality do exist, the differences are more obvious. There is probably little to be gained, therefore, in altering the current structure of this section. Issues regarding the Stage 3 guidance will be dealt with later.

Pitch

2.6 Due to the varying nature of local authorities, their size, working methods and internal structures, this guidance will be used by officers with a wide variety of expertise, ranging from those who are leading the way in the development of local air quality management to those who

are only just coming to terms with the concept. This guidance must, therefore, be clear and unambiguous, providing the technical information necessary to carry out review and assessment in an accessible and useable format.

2.7 In its current form, the guidance has a greater emphasis on the formal and technical than it does on the readable. The document is not easily understandable to a technically experienced audience and it is felt that those for whom air quality management is still new, and who therefore need this guidance the most, would have great difficulty with some of the structures and language used. As noted earlier, repetition does not make for the most accessible document and so should be avoided where possible. On a more detailed level, phrases such as "will decrease by a factor of 0.7" should be avoided; there is a potential for confusion as to whether a decrease of 70% or 30% is indicated. A less ambiguous phrase would be, for example, "will decrease by 30%, to 70% of the original" which is more in line with every day language.

2.8 Care also needs to be taken with the use of terms such as "significant", "excessive" or "prolonged". For example, "...where traffic travels at mean speeds <10 km/hr for *prolonged* periods". Such subjective terms, if not correctly explained, can lead to confusion and a divergence of approach among local authorities. They should therefore be avoided.

2.9 To assist the end users of this guidance, it is suggested that greater use is made of illustrations such as flow charts and worked examples. Both of these tools provide an excellent guide to the process itself and the application of information contained within it. For example, paragraphs 7.9 and 7.12 require the identification of 1km by 1km squares with an emission of PM_{10} of greater than 10 tonnes for low level dispersed sources. Assuming that this is an annual figure and that the sources will be primarily domestic, how is the emission to be calculated? A single worked example here would be invaluable and prevent a great deal of confusion; the current guidance would invite the development of a different calculation method in each authority.

Statistical Conventions

2.10 Extensive use is made within the guidance, particularly within the guidance on Stage 2, of surrogate statistics and calculation factors, which will be referred to in this paper as statistical conventions. These are extremely useful as a method of providing a simple estimate of pollutant levels, thereby avoiding the need for complex and expensive monitoring and modelling techniques. As a cost effective and simple indicator of likely air quality problems, NSCA fully supports the use of statistical conventions in this guidance.

2.11 However, such statistics are often the result of research which is at the leading edge of air quality knowledge in this country. In some cases, this research is very recent and so it is to be anticipated that the figures themselves are likely to be one of the most contentious aspects of this guidance.

2.12 As noted earlier, local authority decisions will be made on the basis of the contents of the guidance note and it is thus highly likely that the guidance will be subject to intense scrutiny in the public arena. In order that the statistical conventions are robust enough to withstand such scrutiny, they should all be referenced in terms of the research papers from which they are derived. At present, references are few and far between.

2.13 Having said this, the guidance should contain all the information needed to carry out review and assessment without the need to refer to research documents. For example, the guidance includes reference to the Willis *et al* 1997 report but remains unclear as to whether the reader needs to have a copy on hand when carrying out the review and assessment process. If this is the case, then it is unacceptable and the result of the report should be included in the guidance. Where research results are included they should be translated into a useable format and the guidance should be clear and unambiguous as to their use.

The Guidance Package

2.14 The use of the Internet to make available air quality information is welcomed by the Society, although it must be remembered that while nearly all local authorities have access to the Internet at some level, its availability is often highly restricted or even barred to officers outside IT departments. The guidance makes several references to information on the Internet, most notably the background pollutant concentration maps developed by Stedman; officers without direct access will be at a disadvantage. It is therefore recommended that when the guidance is finally issued to local authorities, the following package is included:

- The recommended "filter" models, e.g. DMRB (see later specific references on version), the Environment Agency's GSS Stage 2 model, etc;
- National background maps with supporting databases;
- National Air Quality Archive;
- National Emissions Factor Database.

2.15 These should be issued in electronic form, either on CD-ROM or 3½" floppy disk, although the final format decision should be informed by whatever feedback the Department received following the previous issue of the National Air Quality Archive on CD-ROM. It is felt that paper copies of this information should be available for those authorities without access to suitable IT equipment.

2.16 Such a package would allow local authorities to initiate the review and assessment process almost

immediately without having to engage in a time consuming document acquisition exercise. It is, however, recognised that producing this package would impose another action on the already tight time scale for the production of the final guidance.

2.17 Concern is currently being expressed that the time available to local authorities to complete their first air quality review and assessment will be and is being eaten into by any delays in producing this guidance. Such concern must, of course, be balanced with the need to produce the right guidance first time, for all the reasons already expressed in this response. In order to resolve these two conflicting issues, it is recommended that the guidance on Stage 1 is published first, as it appears to be both the most complete and least controversial, with the remaining guidance being produced when it is complete. Such an approach could obviously only be taken if, as is suggested earlier in this paper, the Stage 1 process is lifted out of the pollutant specific chapters and amalgamated into a separate section.

2.18 Issuing Stage 1 guidance separately has the following advantages:

- the guidance can be produced quickly, allowing local authorities to initiate their review and assessment process while Stages 2 and 3 are still being finalised;
- it could provide a focus for Stage 1 review and assessment which was otherwise lacking in a large number of authorities and remove any confusion which may exist as to the differences between Stages 1 and 2. This is particularly important due to the statutory duty on all local authorities to carry out Stage 1, while Stage 2 is of a more optional nature;
- it would give an early indication of whether the pitch and content of the guidance is satisfactory for local authority purposes.

3. Specific Comments

Stage 1 Review and Assessment

3.1 Concern has been expressed that the list of sources about which information is required for Stage 1 is incomplete. Consideration should therefore be given to the inclusion of airports (above a certain size, possibly 5 million passengers per annum), large car parks and street canyons. The latter is included on the basis of Phase 1 Pilot Study work carried out in Cambridge which found exceedances of the air quality standard for PM_{10} within a street canyon at flows significantly lower than the "cut off" point for Stage 2. This is currently 25,000 vehicles per day for NO_2; there is currently no cut off within the guidance for PM_{10}. It is assumed that this is an error as local authorities are required to collect traffic data for the Stage 1 PM_{10} assessment and to assess its effects in Stage 2.

3.2 Further consideration should be given to the use of the simple existence of a Part B process as a filter for progress to Stage 2. Annex 2 to the guidance contains a list of process types marking those considered a potentially significant source for each pollutant. This approach fails to quantify the risk of significant emission and could lead to Stage 2 or 3 assessments being needlessly carried out. The problem is most clearly illustrated by the guidance for benzene and 1,3-butadiene, where the existence of a petrol station within the local authority's area would lead to Stage 2 for benzene, whereas the presence of a medium sized combustion plant, even if it is gas fired, would result in a Stage 3 assessment for 1,3-butadiene. This is clearly excessive but is likely to occur in every local authority area in the country. Therefore some further filter is needed, certainly in these cases and probably in several more.

Stage 2 Review and Assessment

3.3 The two areas within Stage 2 which appear to have given the greatest cause for concern and have therefore attracted the most comment, are the use and limitations of the Design Manual for Roads and Bridges (DMRB) and the estimation of NO_2 concentrations.

3.4 Within the guidance for Stage 2 carbon monoxide, nitrogen dioxide and PM_{10}, there is a heavy reliance on the use of DMRB. DMRB has a number of well documented weaknesses, including the fact that it was originally intended for use on single, free flowing roads in an "open" environment, not congested urban streets. In addition, the outputs from this model are not consistent with the standards and averaging times laid down in the National Air Quality Strategy. This incompatibility has led to some highly confusing calculations, particularly within the guidance for NO_2.

3.5 For example, the guidance requires the calculation of annual mean NOx and peak hour NOx using DMRB. This document does neither; instead it gives a method for the calculation of average concentration during the peak traffic hour which, in terms of review and assessment, is not particularly useful.

3.6 It is understood that a revised version of DMRB is very close to completion and early indications are that it will avoid many of the problems and inconsistencies thrown up by the current version. At the very least, a model which produces results consistent with the requirements of the National Air Quality Strategy would remove the need for many of the statistical conventions used in the guidance and thereby greatly simplify the whole process.

3.7 In any case, DMRB, regardless of the version used, is not the only model available and there may be circumstances where other, equally simple models are more appropriate. The Guidance Note LAQM.TG3(98) *Selection and Use of Dispersion Models* mentions a range of models of varying complexity and it would therefore appear to be

an inconsistency that only two - DMRB and the Environment Agency's Guidance for Estimating the Air Quality Impact of Stationary Sources - are referred to in the Pollutant Specific Guidance. The inclusion of these two models alone would be more understandable if they produced concentrations in the form required by the Strategy but, as further manipulation of the data is necessary, the reasons for their sole inclusion remain unclear.

3.8 The Stage 2 guidance for NO_2 has caused great concern and confusion both in terms of the process for estimating peak hourly and annual average and the technical content of the section. The combination of hourly and annual NOx and NO_2 values, percentiles, measured values, modelled values, conversion factors and correction factors make the process unworkable, added to which, some of the surrogate statistics used would appear to have a somewhat questionable validity. It is suggested that this section be extensively revised using the following guidelines:

- a clear distinction between the estimation of annual average and hourly maximum, possibly by splitting the chapter into two parts;
- the use of non-technical language and the inclusion of worked examples wherever possible;
- the use of a screening model which uses commonly available data and produces results consistent with the National Air Quality Standards (it has been indicated that the new version of DMRB will achieve this);
- referencing all surrogate statistics and an explanation of all assumptions, for example, the assumption in paragraph 6.16 that the background NO_2 concentration will reduce by 50% by 2005. The addition of 5 ppb to all diffusion tube data (paragraph 6.31), thereby making the Stage 2 cut off point 25 ppb rather than the 30ppb given in paragraph 6.7, is also a cause for concern.

Stage 3 Review and Assessment

3.9 The chapter on Stage 3 review and assessment is divided into two parts. The first deals with some of the technical tools required for Stage 3, i.e. monitoring, modelling and emission inventories, while the second discusses pollutant specific issues.

3.10 With the recent publication of specific guidance on monitoring (LAQM.TG1(98)), emissions inventories (LAQM.TG2(98)) and dispersion models (LAQM.TG3(98)) much of the detail concerning the tools required for Stage 3 has been provided, which calls into question the purpose of the guidance contained in the first part of this chapter. Currently it provides a very brief summary of what is contained in the other documents without illustrating how they are to be used in Stage 3 and how they combine to provide the overall review and assessment.

3.11 Simply reiterating what appears elsewhere is not particularly useful, whereas the provision of a wider view of how the various parts of the picture integrate could help remove some of the confusion which currently exists. It is suggested that further thought should be given to the objective of this part of the guidance note and reformulating it to focus on that objective.

3.12 The second part of this chapter, which deals with pollutant specific issues, is equally brief and covers only PM_{10} and NO_2. The guidance here is scant and is currently insufficient for the needs of most local authorities. However, it is recognised that much of the knowledge required for explicit guidance on Stage 3 is currently being developed by research and so is not yet available in a useful form. This fact needs to be recognised by the Department and followed up with a commitment to undertake a programme of continually updated guidance and training as and when developments occur.

Consultation for Local Air Quality Management

This paper sets out the issues and discusses the ways forward in relation to Local Air Quality Management consultation. It has been written in response to concerns raised by the NSCA's Air Quality Management Committee, whose members include representatives from local authorities, business, industry and other non-governmental organisations, and was discussed by them at their meeting on 8 July 1998. The paper is published here as submitted and it is intended to open up a discussion as to what constitutes good practice in relation to consultation for local air quality management. The NSCA invites the readership of Clean Air to express its views on the subject with the intention of feeding these into the wider debate.

Introduction

1. With the publication of the eight guidance notes on Local Air Quality Management (LAQM) most of the technical framework is in place. Consultation remains the greatest area of concern to local authorities and it is the one that Air Quality Managers, as the main operators of LAQM, are probably the least well equipped to deal with at the present time.

2. Within the obligation to consult, there lies a great deal of uncertainty as to the extent and form of that consultation. Whilst subject to certain legal constraints, it is left to the local authority to make a judgement as to the appropriate level of consultation and who should be consulted; the commitments are, therefore, very open ended.

3. Against this backdrop, it would obviously be desirable that a consensus on what constitutes consultation good practice should be reached. The National Air Quality Forum, representing all the relevant interests, i.e. those who must undertake consultation and those who would expect to be consulted, would appear to be the most favourable arena for this discussion. It would therefore be helpful if the Forum could consider the following review of the process of consultation for Local Air Quality Management and comment on a set of principles for its operation contained in this paper.

Local Air Quality Management

4. The *Environment Act 1995* sets out, in Schedule 11, paragraph 1, the statutory consultation requirements for Local Air Quality Management, laid out in Part IV of the Act. Guidance note LAQM.G1(97), Framework for Review and Assessment of Air Quality, provides further clarification on what the consultation should contain, who should be consulted and at what stage this should take place. The structure of the process for LAQM, as laid down in the Act, is as follows:

i. Review the current and future air quality within the local authority's area.

ii. Assess whether the air quality standards are being exceeded or will be exceeded in the future.

iii. Identify the parts of the local authority's area where these exceedances are likely to occur.

iv. Declare Air Quality Management Areas for those parts.

v. Carry out a further assessment of the air quality within the Air Quality Management Areas.

vi. Report these assessment results.

vii. Prepare an action plan for the Air Quality Management Areas which sets out what is to be done to achieve the air quality standards with timescales.

5. "The future" in this context should be taken to mean by 31 December 2005, as stated in the *Air Quality Regulations 1997*. According to the Act, consultation should take place at steps i, ii, v and vii, and a list of statutory consultees is given.

6. Subsequent to the Act being passed, guidance on LAQM, particularly guidance note LAQM.G1(97), has developed a three stage process for "Review and Assessment", putting the two activities together rather than separating them as in the Act. This has led to confusion among local authorities as to when the consultation should take place in relation to Review and Assessment and what form it should take. Should there be consultation at each of the stages or should it be restricted to one or two? Is a simple "leaflet drop" approach sufficient or should more active involvement be sought? How far should the general public be engaged?

7. These questions are thrown into sharper focus when one considers time constraints. LAQM.G1(97) states that the Government expects Review and Assessment to be completed by December 1999 (two years after Part IV of the Act came into force). Furthermore, once an Air Quality Management Area has been declared, the local authority has one year to report on the further assessment within that area (steps v and vi), leaving only four years to develop the action plan (step vii), carry it out and achieve the air quality standards. Whether meaningful consultation at each stage can be fitted into this time frame is in some doubt and, therefore, there must be careful management of the consultation process.

The Meaning of Consultation

8. Let us be clear what is meant by consultation. The process of consulting others on a given subject can include various levels of involvement but for the purposes of LAQM, this paper shall consider only three:

- **Information** - at this level the flow of information is essentially one way and while responses may be welcomed, they are not required for further action to be taken.
- **Consultation** - at this level responses are invited and the information flow is increasingly two way. However, the consulting body is removed from the consultees and the issue concerned is developed by the consulting body without the involvement of the consultees. Therefore, the responses tend to be simple acceptance or rejection of the proposals.
- **Participation** - at this level, the consultees are actively involved in the development of the issue concerned through participatory exercises, discussion groups, etc. This approach can be more time and resource intensive but will, if carried out properly, develop results in which the participants have a greater sense of ownership and which are therefore more likely to be successful.

9. The need for an effective consultation process cannot be over stressed. The system of Local Air Quality Management created by the *Environment Act* is highly innovative in terms of other environmental legislation; most important in this context is that it clearly links a local authority obligation to a set of environmental standards. Whereas with other legislation the implementation of the given act or regulations is an end in itself, implementation of LAQM must also result in the achievement of the air quality standards and objectives.

The Process of Consultation

10. Vital to this achievement is an effective Air Quality Management Area action plan (where it proves necessary) and if the action plan is to be successful it needs the active participation of many different professionals, agencies, businesses and, most importantly, the general public. This participation will not be obtained unless all of these parties have a sense of ownership in the action plan and the only way to generate this is to actively involve them in the development of the plan. Effective consultation and participation are therefore essential to the whole system of local air quality management.

11. The Act sets out the statutory minimum in terms of consultees:

- the Secretary of State;
- the Environment Agency;
- the relevant Highways Authority;
- all neighbouring local authorities:
- the relevant County Council (if applicable);
- any relevant National Park Authority;
- other relevant public authorities as the local authority considers appropriate;
- bodies representative of local businesses and other bodies the authority considers appropriate.

12. Guidance note LAQM.G1(97) advises that relevant community and environmental groups and local councils be added to the list and that, in England, relevant material should be copied to the regional Government Office. It is therefore recommended that local authorities add the following to their list of consultees:

- the local Health Authority;
- the relevant Planning Authority (at both District and County level where appropriate), to include those responsible for formulating Local Development Plans, Structure Plans and Unitary Development Plans;
- the relevant Local Agenda 21 Coordinator;
- Local Agenda 21 working groups and forums;
- associations of local tenants and residents groups;
- regional pollution control groups;
- the local Chamber of Commerce;
- major local employers;
- transport users groups;
- transport providers;
- the local Passenger Transport Executive.

13. An effective process of consultation, participation and joint working is, in many ways, as important to the success of Local Air Quality Management as the more technical processes of review and assessment and air pollution monitoring, modelling and emissions inventories. The question of whether local authorities have consulted sufficiently or at the correct stage or indeed whether the process has taken in the full range of opinion available is likely to be one of the most contentious aspects of Local Air Quality Management.

14. While the Act lays down statutory minimum requirements for consultation, ambiguities exist between it and the guidance which has emerged from the Government. This leaves local authorities open to challenge with respect to their review and assessment process. The fact that there is no specific guidance on the consultation process which local authorities can fall back on increases the likelihood that these challenges will delay the successful implementation of LAQM. Any guidance on consultation processes and strategies, especially if issued by the Government, would be extremely welcome. In recent years there have been many advances in the techniques available to consulting bodies and many of these would be extremely useful to local authorities in fulfilling their duties under the *Environment Act*.

Principles for Local Air Quality Management Consultation

15. Finally, when considering their consultation process, it is recommended that local authorities observe the following principles:

a. The local authority should develop a consultation strategy, which makes clear its intentions, and this should occur at the earliest possible stage of the review and assessment process. The strategy should include:

- the structure of the consultation process;
- the aims and objectives of the process;
- a list of consultees (with named individuals where possible);
- which techniques are to be used at which stages in the process;
- how the results of consultation are to feed into the formal review and assessment and action plan formulation processes.

b. The consultation process should be in proportion to the scale and implications of the issue. Local authorities should avoid letting consultation become an end in itself and should always relate the process to the wider system of LAQM. In addition, the techniques used should take into account the extent to which consultation can influence the outcome at that stage.

c. The consultation process should be open and transparent. There should be a clear "audit trail" for all decisions made concerning the process and which come out of the process. It should also be clear to those inside and outside the process what that process is, what its objectives are and who the consultees are. Transparency and openness will help to generate trust, which in turn will aid engagement and ownership among consultees, thereby increasing the likelihood that the process will achieve its objectives.

d. The process should make full use of the expertise of those involved. No one individual in the process will possess all of the skills necessary to operate an effective LAQM system and therefore tasks should be divided accordingly. For example, officers technically expert in pollution control may well have little experience of consultation, whereas that experience and expertise should exist in Agenda 21 or planning departments. Equally, local residents will have a far greater knowledge of their area than local authority officials. Full use should be made of this range of expertise but this will only be possible if the process is inclusive and participatory.

e. The process should be continuous and run in parallel with the technical aspects of LAQM. It is important that consultees are aware that they are part of that process and not simply being consulted as an afterthought or fulfill a legal obligation, which may be assisted by the use of a "standing conference" approach to consultation.

f. Participatory techniques should be used wherever possible. Having accepted this principle it should also be recognised that for some stages of the process there is little that can be influenced by the consultees. For example, Stage One of the review and assessment process is a simple information gathering exercise, and the information required is, in the main, held on public databases. In addition, the guidance on this Stage is highly prescriptive and so there is little room for local deviation. However, it provides an excellent opportunity for initial engagement of the consultees which will help ensure that they are prepared for the more involved, later stages.

Conclusion

16. The Forum is requested to comment on this paper and, specifically, is requested to:

i. consider the list of additional consultees;

ii. request that guidance be produced, preferably by DETR, on consultation with particular regard to providing examples of best practice;

iii. consider the list of general principles as a basis for future best practice;

iv. distribute and publicise this within the organisations represented on the Forum.

AIR QUALITY

Urban Emissions Inventories - Their Uses and Limitations in Dispersion Modelling

Dr Yasmin Vawda
Stanger Science and Environment

The National Air Quality Strategy (NAQS)[1] gave statutory duties to local authorities to review and assess air quality and (where necessary) to draw up and implement action plans to meet the objectives set out in the NAQS. A review and assessment would require information on emissions, and also the use of predictive methods to forecast air quality for the year 2005. It is acknowledged that the objectives for NO_2, PM_{10} and SO_2 are unlikely to be met in many parts of the UK unless further action is taken, and detailed dispersion modelling may need to be carried out for these pollutants.

An atmospheric emissions inventory is a schedule of the sources of air pollutants within a particular geographical area. The inventory usually includes information on the amount of the pollutant released from large industrial sources, average figures for smaller sources, and transport emissions. Emissions inventories are an essential tool in the management of local air quality, and Department of Environment, Transport and the Regions (DETR) Technical Guidance in the preparation and use of atmospheric emission inventories has been published[2]. However, the air quality standards and objectives are set in terms of ambient concentration values, not emission rates.

There are differences between the data required to summarise emissions across a region, to those required for detailed dispersion modelling. This paper sets out the data requirements local authorities will have for dispersion modelling as part of a Stage 3 review and assessment, i.e. for those pollutants which are at risk of breaching the NAQS objectives. The uses and limitations of the information contained in the DETR urban inventories (compiled by the London Research Centre and RSK Environment Ltd) are discussed in this context.

Sources of Emissions Data

There are several sources of data on emissions. These include:

- **The UK Emission Factor Database (EFD)**: This gives representative emissions from the main categories of industrial and transport activities, together with a comprehensive set of emission factors and related technical information. Emission factors are the building blocks of inventories; they enable one to calculate emissions from surrogate data, when direct measurements are impractical.
- **The National Atmospheric Emissions Inventory (NAEI)**[3]: This provides estimates on a 1 km x 1 km grid across the whole of the UK. The inventory includes specific data only on emissions from processes covered by the Chemical Release Inventory and major trunk roads; estimates for many other sources are represented at an aggregate level. The manner in which the NAEI has been constructed is an example of a 'top-down' approach. Information on stack heights, stack exit velocities, variation in traffic speeds, etc (which are required for detailed dispersion modelling), are not available from the NAEI.
- **The DETR Urban Inventories**: DETR has commissioned several urban inventories to be compiled[4]. These are constructed on a 'bottom-up' principle, where local data are used as the starting point and such inventories provide a greater level of resolution than the NAEI. Furthermore, these DETR urban inventories allow actual, monitored emissions data to be included. The methodology used to construct the DETR urban inventories is continually under review by the London Research Centre (LRC) and RSK Environment Ltd.

The DETR urban inventories were not commissioned with the objective that they provide information for atmospheric dispersion modelling. However, they provide much useful data which can be used either directly by dispersion models (e.g. stack heights, location of industrial point sources), or which can be used to estimate the required dispersion modelling parameters (e.g. annual average pollutant emission rates contained in the DETR urban inventories may be temporally disaggregated to derive an approximate diurnal emissions profile).

Input Data Requirements of Dispersion Models

DETR has published Technical Guidance on the selection and use of dispersion models[5]. The term 'air quality

dispersion model' covers a wide range of applications, from simple nomograms and look-up graphs to sophisticated computer programs. The guidance advocates a tiered approach to dispersion modelling, and advises against the immediate use of sophisticated computer packages in the earlier stages of a review and assessment. The complexity of the modelling should be consistent with the risk of failing to achieve the relevant air quality objective.

Major urban centres contain a large number of industrial sources of pollutants as well as many roads. There are few, commercially-available, atmospheric dispersion models which can incorporate a very large number of both point and line sources. Two such systems are ADMS-Urban and INDIC AirViro. Emissions data can be input into these regional-scale models using a digitised geographical map.

The specific parameters required by regional-scale models are listed below:

- Information for chimneys (point sources):
  - OS grid co-ordinate;
  - stack height;
  - stack diameter;
  - stack gas temperature;
  - stack gas velocity;
  - dominant building width and height[6];
  - pollutant emission rate;
  - variation of stack gas emission temperature and velocity with production cycle;
  - temporal variation of pollutant emission rates.
- Information for roads (line sources):
  - location of road;
  - number of lanes;
  - mean vehicle speed on road;
  - traffic flows;
  - vehicle emission factors;
  - vehicle type mix on road (e.g. proportion of heavy duty vehicles);
  - temporal variation of traffic flows;
  - variation of pollutant emission factors with vehicle categories;
  - variation of pollutant emission rates with vehicle speed and year.
- Information for area sources (aggregated line sources and smaller point sources):
  - co-ordinates (corners of 1 km^2 squares);
  - pollutant emission rate;
  - temporal variation of area source emissions.

Once the emissions database has been set up in ADMS-Urban and INDIC AirViro, the user can set up specific search keys - e.g. point sources can be categorised according to process type, and roads can be categorised according to sub-region, average vehicle speed, or percentage of HGVs. The use of these search keys allows model scenarios for different groups of sources to be quickly set up. The emissions databases also allow for a very sophisticated definition of variations in emissions. However, the degree with which this facility can be exploited is usually limited by the level of information available.

The software provided with these regional-scale models permits on-screen viewing of the locations of the point and line sources. It is also possible to display the total emissions in each 1 km^2 square graphically on base maps, and to separate the contributions to ambient concentrations of any particular pollutant from the point, line and area sources. These facilities are very similar to those contained in the CD versions of the DETR urban inventories for inspecting emissions (when interfaced with an appropriate GIS).

Features of the DETR Urban Inventories

The DETR urban inventories can greatly assist local authorities in meeting their duties under the *Environment Act 1995*. The information contained therein is more detailed and of better quality than in any other emissions inventory hitherto compiled; it is in a form which allows rapid source apportionment for each pollutant (e.g. between road traffic and industrial sources). The fact that a consistent (albeit evolving) methodology has been used to compile the DETR urban inventories for each of the regions is useful for the purposes of inter-comparison.

The DETR urban inventories are available on CD, as a number of MapInfo, EXCEL and ACCESS files[7]. Emissions are expressed as tonnes/year for each 1 km^2 square. The contributions from 'line', 'area' and 'point' sources within each 1 km^2 square can be displayed separately. The contributions from different types of processes (e.g. agriculture, domestic fuel use, railways, etc.) can also be displayed separately. Data pertaining to a small sub-region of any of the DETR urban inventories can easily be extracted from the files, and (once copied on to a hard drive) can be revised/amended as necessary. Of the mobile sources (road traffic being the predominant type in most areas), major roads[8] are treated as 'line' sources. Vehicle-kilometres travelled on minor roads are aggregated and treated as 'area' sources. Area sources are also used to represent aggregated emissions from other sources which cannot be defined individually, e.g. domestic fuel use, emissions from agriculture, etc.

For each road link included as a line source, the following information is usually available from the DETR urban inventories:

- road type;
- average weekday am and pm peak hour, and inter-peak traffic flows;
- average vehicle speed.

This information has been embellished by LRC with vehicle type proportions, including details of fuel use. The most up-to-date estimates of vehicle exhaust emissions are used in the urban inventories, based on recent data from TRL and NETCEN. The inventories include an estimate of emissions from vehicle trip cold-starts and trip end hot-soaks. Emissions from road traffic are presented as an annual total, which can be disaggregated on hourly, diurnal and seasonal bases as required, according to traffic statistics held locally.

Sources of Uncertainty in Dispersion Modelling Predictions

The main factors which result in uncertainties in the emissions data, and which would therefore contribute to inaccuracies in the dispersion modelling predictions, are as follows:

- reliance on calculated activity data, e.g. vehicle flows from a traffic model, rather than traffic counts. Clearly it would be impossible to count the traffic on every road of interest. Ideally, hour-by-hour variations in traffic flows and speeds are required, and also daily variations. Local authorities could use their own data to arbitrarily disaggregate the annual totals to derive this information;
- there is the potential for inaccuracies in the predicted air quality at roadside receptors, if specific traffic data are missing for nearby roads. Between about 60 - 90% of all road traffic in an area can usually be assigned to individual roads; the minor road element is weighted according to the density of trip ends across the area or (more usually), the density of the overall road network;
- reliance on emission factors (e.g. vehicle exhaust emission factors) rather than measurements of actual emissions. Clearly it is impossible to monitor the exhaust emissions from every individual vehicle;
- use of emission factors which have a large degree of uncertainty, e.g. for benzene and 1,3-butadiene from industrial processes. Although few processes may be expected to emit these substances, those that do are likely to be significant in terms of local air quality. Where possible, emission factors derived from UK studies are used, but there is recourse to European Environment Agency and US Environmental Protection Agency (EPA) data if UK-specific information is unavailable.

When modelling local air quality, background emissions must be included in a sensible manner. For example, if a large number of industrial, point sources are modelled simultaneously, then general background emissions estimates can be treated as area sources (derived from the NAEI or a regional inventory), but care must be taken to ensure that if the point sources are included in the figures for these 1 km x 1 km squares, they are subtracted out to prevent double-counting. Moreover, it is sometimes appropriate to include details of large sources outside the study area. Most models are best suited for conservative pollutants, i.e. those emissions which are not chemically transformed in the atmosphere (which is a good approximation for many pollutants); in such cases, the predicted concentration is directly proportional to the emission rate, i.e. if the emission rate is doubled, the predicted concentration is also doubled. The collation of accurate emissions data is therefore extremely important.

Limitations of the DETR Urban Inventories

The choice of model is crucially dependant on the availability of suitable emissions data. It is not necessarily helpful to invest in an expensive and time-consuming regional-scale model (e.g. ADMS-Urban or INDIC AirViro) if the local problems of concern do not warrant it, or if the emissions data which are potentially available to the local authority are not adequate. The DETR urban inventories will go a long way to meeting the requirements of the most demanding of models, yet it is inevitable that the data which they contain will need to be adjusted and enhanced for each specific study.

Additional data which a local authority may need to compile for a Stage 3 review and assessment could include:

- greater resolution of the variations in traffic speeds along a link. However, there are no (generally available) emission factors for instantaneous speeds or acceleration/deceleration;
- improved geographical mapping to better represent curvature of roads;
- better vehicle type mix along particular roads;
- all the above data for both the existing situation and year 2005; future projections were not part of the remit for the DETR urban inventories.

Emission estimates for PM_{10} are subject to a greater degree of uncertainty than those for other pollutants (due to the inability of current emissions inventory methodology to track and characterise the very many diverse anthropogenic and natural sources of PM_{10}, and also the confounding issue of secondary PM_{10} formation). These subjects are currently being studied by the Atmospheric Particles Expert Group (APEG), which will report its findings to the DETR later in the year. Emissions inventories are not able to quantify secondary pollutant formation; for example, as part of the First Phase Authorities work, Birmingham City Council found that the INDIC AirViro predictions of the seasonal average and high percentile values for CO and NO_x followed the expected distribution of these pollutants, with the maximum CO being similar to the maximum measured values. However, the pattern of the predicted PM_{10} values were completely different to those for CO and NO_x, which suggested that the inventory for PM_{10} could be in error. A similar result was obtained in the First Phase Authorities modelling carried out for Belfast.

The emissions in the DETR urban inventories are expressed as annual averages, which are useful for annual mean predictions, i.e. for benzene. However, the temporal variability of emissions and peak emission rates would be needed for certain pollutants (e.g. SO_2), which have standards expressed in shorter averaging periods. The DETR urban inventories do not reflect peaks in emissions and therefore should be treated with caution for forecasting episodes or pollution events. However, Technical Guidance[9] pertaining to individual pollutants provides empirical factors which can be used to extrapolate short-term average and percentile statistics from annual mean predictions. Moreover, local authorities can attempt to temporally disaggregate the annual emission estimates in the DETR urban inventories, and advice on how to do this may be sought from the DETR telephone help-lines.

Uncertainties in Line Source Data

By virtue of the scale of the DETR urban inventories, it has been necessary to make some approximations regarding certain sources. The urban inventories make much use of traffic models, but these provide only calculated vehicle flows (not from actual traffic counts along roads of interest) - they usually only give a very basic vehicle type mix, and they account for only the major roads. It is probable that actual traffic counts made by a local authority for specific roads of interest are likely to be more accurate and useful than the estimates in the relevant urban inventory.

It is also important to note that vehicle exhaust pollutant emissions factors, although segregated according to vehicle and engine size/type/fuel, speed, drive cycle and year[10] are still subject to uncertainty, i.e. any one vehicle is quite likely to be some way from the 'average' for its group in terms of its emissions at any given time, and any useable emissions factors must be based on the average characteristics of sensible sub-sections of the vehicle fleet. Moreover, factors such as vehicle condition, age and operating efficiency, driver behaviour and ambient temperature, as they affect exhaust emissions, are not accounted for in the emission factors.

The positioning of road links within the urban inventories is approximate, i.e. straight line segments are assumed, when in reality roads may curve/bend considerably. Therefore, the position of the 'line' sources are not accurate enough for very detailed dispersion modelling of, say, specific road junctions; fresh map work would be required for such investigations. Also, the urban inventories do not recognise any roads as street canyons.

Uncertainties in Point Source Data

A local authority is advised to cross-check their list of Part 'A' and Part 'B' processes against those included in the DETR urban inventory. This is general good practice and combats the inevitable problem of the dating of the information contained in the DETR urban inventories. It is noteworthy that, where available, the actual emission rates of pollutants (as measured during periodic, compliance stack monitoring) have been incorporated into the DETR urban inventories. However, it has to be recognised that stack monitoring is intermittent, and often not carried out on all stacks, even at Part 'A' processes. Stack emissions monitoring of Part 'B' processes is not as frequent or comprehensive as that of Part 'A' processes. Moreover, stack emissions are not always continuous, and the load/shutdown/diurnal characteristics of emissions need to be taken into account, for the purposes of dispersion modelling.

Conclusions

The DETR urban inventories contain good quality and up-to-date information on emissions, much of which can be used for dispersion modelling. The data are quality assured, and are under continuous review. The data follow a standardised format for all regions. Moreover, LRC can, on request, provide more detailed data than those readily extractable from the CD.

The DETR urban inventories would fulfil the requirements of Stage 1 of a review and assessment in that they provide a spatially-defined register of emissions for the current situation. However, the inventories do not contain estimates of emissions for year 2005. Also, information on PM_{10}, benzene and 1,3-butadiene emissions is not as robust as for the other pollutants of concern for local air quality management.

For stack emissions, the data in the DETR urban inventories are adequate for 'screening' and 'intermediate' type modelling, but the data are probably not detailed enough for regional-scale models which would need information on the temporal variations in emissions. For roads, the data in the urban inventories may again be sufficient only for 'screening' and 'intermediate' type modelling.

Local authorities may need to collect more detailed information, particularly for Stage 3 of a review and assessment. Local authorities would be advised to check inventory data that may be used for any detailed dispersion modelling, against any specific data which the authority holds. It is important to note that the DETR urban inventories do not take account of proposed developments, information on which the local authorities will receive from planning applications, etc. To assess the impact of new and proposed schemes, local authorities will have to collate additional information directly from the applicants/developers.

The limitations of dispersion modelling should be recognised. Practical dispersion models are best suited for primary emissions modelling, and cannot reliably account for secondary pollutant formation. In particular, all models have difficulty performing well in calm wind speed

conditions, which are those likely to result in pollution episodes.

References

1. The United Kingdom National Air Quality Strategy, DOE, March 1997, The Stationery Office.
2. 'Preparation and Use of Atmospheric Emissions Inventories', LAQM.TG2(98), The Stationery Office.
3. UK Emissions of Air Pollutants 1970-1995, AEAT-1746/Issue 1, A.G. Salway, H.S. Eggleston, J.W.L. Goodwin and T.M. Murrels, June 1997, DETR.
4. DETR commissioned urban inventories for Merseyside, Bristol, Southampton and Portsmouth, Swansea and Port Talbot, West Midlands, Greater Manchester, Glasgow, Middlesbrough and Teesside and West Yorkshire. The London Boroughs commissioned a similar urban inventory to be drawn up for the Greater London area.
5. 'Selection and Use of Dispersion Models', LAQM.TG3(98), DETR, The Stationery Office.
6. Building wake effects are often disregarded if no information is available of the nearby structures.
7. On request, LRC can convert the MapInfo files to ArcView, GGP or any other common GIS data format. A good understanding of GIS operations is a necessary pre-requisite for inspecting and using the regional inventories in a detailed manner.
8. i.e. those with > 400 vehicles/hour in the LTS transport model for the London Atmospheric Emissions Inventory.
9. 'Technical Guidance on Review and Assessment: Pollutant Specific Guidance', LAQM.TG4(98); draft published for consultation by DETR, March 1998.
10. Database available on the Internet http:www.london-research.gov.uk/emission/main.htm

Acknowledgements

The advice and helpful comments provided by Charles Buckingham (LRC) and Prof. Bernard Fisher (University of Greenwich) are gratefully acknowledged. This paper was presented at the UK Dispersion Model Users' Group meeting in London on 10 June 1998.

DETR operate a number of telephone help-lines for local authorities, to advise upon the air quality review and assessment process. The numbers are as follows:

Emissions inventories:	
traffic and area sources (LRC)	0171 7931965
Emissions inventories:	
industrial sources (RSK Environment Ltd)	01306 743312
Air quality monitoring (NETCEN)	01235 463356
Dispersion modelling	
(Stanger Science and Environment)	0181 256 4972

Indicators for Air Quality and Sustainable Development

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This paper presents some ideas for key indicators of air quality which may be used to monitor progress in the forthcoming Sustainable Development Strategy. It discusses the possible development of a single 'headline' indicator of air quality.

The Sustainable Development Strategy: "Opportunities for Change"

1. 'Sustainable development' is a phrase that has become widely used in recent years, particularly during and since the Earth Summit in Rio de Janeiro in 1992. Following Rio, the UK was one of the first countries in the world to prepare a national Sustainable Development Strategy[1], published in 1994, and a set of Sustainable Development Indicators[2], published in 1996. The strategy and the set of indicators are currently being reviewed and revised for publication around the end of this year. A consultation document "Opportunities for Change"[3] on the proposed strategy was issued in February. It is intended to publish the strategy by the end of 1998, along with a key set of indicators, to monitor and report on progress.

2. The Government's view of sustainable development is based on four objectives:

- social progress which recognises the needs of everyone
- effective protection of the environment
- prudent use of natural resources
- maintenance of high and stable levels of economic growth and employment.

In short, it is about ensuring a better quality of life for everyone, now and for generations to come. The sustainable development strategy will comprise an exploration of sustainable development issues as they affect a country, region or area; a description of principles and key policies; and indicators of progress and targets to aim for.

3. A framework has been developed for the strategy comprising the following themes:

- developing goods and services involving use of fewer natural resources
- promoting sustainable communities
- managing and protecting the environment and resources
- sending the right signals
- encouraging international action.

Indicators of Sustainable Development

4. Indicators of sustainable development are not just summary or descriptive statistics. They need to be strongly linked to sustainable development objectives and actions required to achieve these objectives. Furthermore the indicators need to be developed to communicate with and encourage actors, who can have an effect, and to monitor actions. Indicators must therefore be meaningful and resonant.

5. A framework is being developed, based on that in paragraph 3 above, with a number of sub-themes. Key indicators are being identified within each sub-theme. This builds on work done by six advisory groups of experts over the last year to develop indicators for various environmental media. It also draws on work by UNCSD, OECD, EEA, Eurostat and other countries.

6. Many indicators are relevant to more than one sub-theme, but they have been allocated to what is felt to be the most relevant. This is not the traditional approach to an indicator framework and leads to indicators, for example on energy and transport, being scattered over different themes, but it does provide an integrated approach to sustainable development. About 250 possible indicators have been identified so far, but it is likely that the final set will only include about half this number. High level indicators present an overview or summary, but are not closely linked to particular policies. Too much detail on the other hand obscures the overall picture. Around 120-150 seems about the number required to be sufficient to cover the main issues and be manageable for the reader.

Indicators of Air Pollution

7. Many of the pressures causing air pollution, for example energy production and consumption, transport etc, come under the first theme 'development of goods and services'. Most of the 'state' indicators on air quality come under the third theme 'managing and protecting the environment and resources', for which the following sub-themes have been suggested:

- global atmosphere and climate change
- biodiversity, habitats and wildlife
- renewable and non-renewable resources
- environmental health
- landscape and the wider countryside.

8. Thus global atmosphere and climate change is covered

by the first sub-theme. Indicators for acid deposition are included in the second sub-theme 'biodiversity, habitats and wildlife'. Indicators for air quality are included under the fourth sub-theme 'environmental health'. The following have been suggested under the heading of 'air pollution':

- Exceedences of air quality standards
- Concentrations of selected air pollutants
- Overall index of air quality
- Emissions of key pollutants from traffic/industry eg particulates, VOCs, lead
- Reduction in use of toxic materials eg chlorine
- Respiratory illnesses.

The first three are all indicators of air quality concentrations. The problems of providing a national picture from site information are discussed below.

Indicators of Air Quality Concentrations

9. The air quality indicators presented in the first 'Indicators of Sustainable Development' report were in terms of trends in concentrations of ozone, nitrogen dioxide and particulate matter at selected sites in the UK. The trends were in hours of 'accumulated exposures over a threshold X', where X was the pollutant concentration level that was considered to be poor. Whilst presenting information in this way highlighted peak trends in pollutant concentrations, underlying trends were not shown and so there was no general feel about whether air quality was improving. It was recognised at the time that presenting site specific information was not ideal and further work should be carried out to develop appropriate aggregated indicators. The difficulty is to find a valid method of combining information from a wide number of sites, in order to get some idea of what is happening at a national level, without obscuring too much the variability between sites.

10. Last year, DOE let a contract to WS Atkins Environment to produce proposals for more aggregated indicators of air quality using pollutant concentration data collected at national monitoring sites across the UK. The objective was to produce ideas and a range of suggestions for presenting national indicators of air quality.

11. The contractors recommend a method for presenting aggregate national indicators by combining data from a large number of sites to illustrate overall trends. The method uses summary measurements for individual sites, for example the annual average, and then aggregates these over sites to demonstrate the status and trends in pollution level. Indicators have been elaborated for pollutants for which there are UK National Air Quality Standards (benzene, 1-3 butadiene, carbon monoxide, lead, nitrogen dioxide, ozone, PM_{10} and sulphur dioxide) and include trends in both annual average and short-term peak concentrations representative of chronic and acute health effects of air pollution.

12. The indicators are presented as simple line graphs which show the composite average and the range (minimum and maximum) of the aggregate concentrations in each year. These can be used to identify trends, compare levels against the national standards and to assess progress towards meeting the objectives for 2005 set out in the UK National Air Quality Strategy. A summary of the report, prepared by Greg Archer and Victoria Sykes of WS Atkins Environment follows this report.

13. For an overall index of air quality, the DETR air pollution bands could be used to generate a single indicator covering a range of different pollutants. This would be aggregated across sites and pollutants and based on the number of days of moderate, high and/or very high pollution at each site in each year (the position for the highest individual pollutant rating at the site in the day would determine the overall rating for the site).

14. The Minister of State for the Environment, Michael Meacher, has set the challenge of developing a small set of 8-10 headline indicators which encapsulate 'sustainable development'. He wants the headline indicators to focus public attention and have a high profile by, for example, being reported on the 6 o'clock news as are the key economic indicators. An indicator of air quality is likely to figure in the final set. At a recent seminar on sustainable development indicators, he asked 'would it be possible to develop a headline indicator which records the number of days of high air pollution, using measurements at a number of representative sites, and covering a number of different pollutants?'

Feedback

15. DETR are evaluating methods of presenting indicators of air quality and welcome comments. Indeed, comments more generally on what should be included in the overall set of sustainable development indicators would be appreciated. These should be sent by the end of August 1998 to:

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Obtaining the Report

16. The report *Development of Aggregated UK Indicators of Air Quality* is published by The Stationery Office and is priced £19.00 (ISBN 0 11 753442 0). It is available from The Publications Centre (mail, telephone and fax orders

only) - PO Box 276, London SW8 5DT; general enquiries 0171 873 0011; tel: 0171 873 9090; fax:0171 873 8200. It is also available from The Stationery Office bookshops, its Accredited Agents and through good booksellers.

17. Copies of the Executive Summary can be obtained on request from Patrick Atagana, DETR, 5/H15, Ashdown House, 123 Victoria Street, London SW1E 6DE; fax: 0171 890 6489.

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1. *Sustainable Development: The UK Strategy.* Cm2426, HMSO, 1994.

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Aggregated UK Air Pollution Indicators

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WS Atkins Environment

This paper presents the results of a study to develop aggregated UK indicators of air pollution. It was undertaken by WS Atkins Environment for the Department of the Environment, Transport and the Regions (DETR).

Introduction

For the UK to achieve sustainable development, tools are needed to provide a robust basis for decision making. These *indicators* have the aim of both assessing and facilitating progress towards sustainable development, quantifying information in a manner which both simplifies and enhances its value. The first edition of *Indicators of Sustainable Development for the United Kingdom* was published in 1996. For air quality this included site specific trends in accumulated hours above a threshold for three pollutants as the indicator of pollution levels (status). Whilst these indicators highlighted the frequency and severity of peak levels in pollutant concentrations, they could not readily be related to health effects. They also only illustrated trends at a limited range of sites, which were not necessarily representative of conditions across the UK.

To address these concerns, the DETR contracted WS Atkins Environment to produce ideas and a range of suggestions for presenting aggregate national indicators by combining data from a large number of sites to generate overall trends. Indicators produced by aggregating data across sites are more reliable, comprehensive and informative than site specific indicators for assessing overall levels and trends in pollution. Aggregating data in a statistically and scientifically rigorous manner to produce representative indicators, however, presents significant difficulties, particularly with a limited historical dataset. A review of air quality indicators developed by other countries and international organisations concluded few countries have produced aggregate statistics. No *off-the-shelf* solution was appropriate for the UK situation. The methodology adopted is therefore original, but broadly based upon work by the OECD.

Methodology

The methodology uses primary statistics (for example averages and percentiles as used in the UK National Air Quality Strategy) from monitoring data aggregated over sites to demonstrate status and trends in pollution level rather than exceedences above a threshold or surrogate measurements. Primary statistics are preferred because they are:

1. most closely derived from the original monitoring concentration data,
2. independent of the threshold selected,
3. more transparent, and
4. probably more readily interpreted by the public and non experts.

Indicators have been elaborated for pollutants for which there are UK national air quality standards and include trends in both annual average and short-term peak concentrations representative of chronic and acute health effects of air pollution. Only ratified data from the national networks were used. The indicators reported in this paper therefore only include data to 1996. The DETR hope to update the indicators to 1997 for inclusion in the next edition of indicators of sustainable development to be published around the end of this year.

It is not possible to use a statistically representative *sample* because of the limited number of sites for earlier years, missing data and lack of a long term series at some sites. The available data were therefore combined from different locations within site classes (urban, rural etc.) and a series of tests of robustness were performed to establish the effects of including or excluding sites and combining them in different ways. In general, it was found that the results did not differ greatly between options. As a result of these tests, indicators have been produced on the following basis:

- for a site to be included in a particular year, data capture should be at least 50%;
- all sites meeting the above criteria should be included for that year, even though this may lead to different sites being included each year in the aggregate indicator;
- for any year, a minimum of four sites are required to produce an aggregate indicator;
- data from different site classes can be aggregated to produce overall urban (including all sites located in an urban or suburban environment); and rural (including remote) trends; and
- no individual site should be excluded on the basis that it has a different trend from others.

Table 1 summarises how sites were aggregated for each pollutant.

Table 1: Aggregate Indicators

Pollutant	*Indicator*	*Aggregated Site Classes*	*Base Year*
Benzene	Max running annual average	All urban & suburban sites	1994
1,3-Butadiene	Max running annual average	All urban & suburban sites	1994
Carbon monoxide	Max running 8-hr average	All urban & suburban sites	1990
Lead	Annual average	Urban sites, exc. Hotspot sites	1980
		Rural sites	1980
Nitrogen dioxide	Max annual 1-hr	All urban & suburban sites	1987
	Annual average		
Ozone	97th percentile	Urban background, centre,	1988
	8-hr running average	industrial & suburban sites	
		Rural & remote sites	1987
PM_{10}	99th percentile running	Urban background, centre	1993
	24-hr average & annual Average	industrial & suburban classes	
Sulphur dioxide	99.9th percentile 15 min	All urban & suburban sites	1990
	average & annual average		

The indicators are presented as simple line graphs which show the composite average and range of the aggregate concentrations in each year. These can be readily interpreted by the public and non-expert decision makers to identify trends, compare levels against the national standards and to assess progress towards meeting the 2005 objectives.

Results

The indicators are shown in Figures 1 to 11 for pollutants with time series longer than 5 years (see pages 159-163).

The trend in the composite average value for each aggregate indicator is shown in Table 2. This demonstrates small but significant declining concentrations of most pollutants for which it is possible to derive trends, except ozone and peak PM_{10} levels.

Conclusions

Overall the study has demonstrated scientifically robust, statistically rigorous, aggregate air quality indicators can be derived from monitoring data for sufficiently long time-series to derive statistically significant aggregate trends in UK air pollution. Trends related to each pollutant are summarised below:

- *Benzene and 1,3 butadiene*

It was not possible to produce trends as there are inadequate years of historic data to produce a robust assessment. Levels do not however appear to have changed significantly since measurements were initiated in 1992. During this time there have been no exceedences of the Standard at any site in the UK.

- *Carbon monoxide*

Levels of carbon monoxide in urban areas of the UK have declined since 1990 at an average rate of about 1ppm per year, measured as the maximum 8-hour running average. In 1996, there were no exceedences of the Standard, the first year that this had occurred. The downward trend suggests by 2005 the objective is likely to be met at all, or virtually all sites.

Table 2 - Aggregate Trends

Pollutant	*Base Year*	*Trend (significant if >90%)*
Benzene	1994	Insufficient time-series to derive trends
1,3-Butadiene	1994	Insufficient time-series to derive trends
Carbon monoxide	1990	Decrease of 0.9 ppm pa in the urban maximum running 8-hour average
Lead	1980	Decrease in the annual average urban value of 0.035 $\mu g\ m^{-3}$ pa
		Decrease of 0.006 $\mu g\ m^{-3}$ pa in the annual average value in rural areas
Nitrogen dioxide	1987	Decrease of 0.7 ppb pa in annual average urban values
		Decrease of 9 ppb pa in 1-hour maximum urban values
Ozone	1988	No statistically significant trends in urban areas for the 97th percentile 8-hour running average
	1987	No statistically significant trends in rural areas for 97th percentile 8-hour running average
PM_{10}	1993	Decrease of 1 $\mu g\ m^{-3}$ pa in annual average urban values
		No statistically significant trend in 99th percentile running 24-hour average urban concentrations
Sulphur dioxide	1990	Decrease of 1.6 ppb pa in annual average urban concentrations
		Decrease of 20 ppb pa in 99.9th percentile 15 minute average urban values

- *Lead*

The lead aggregate indicator excluded sites at hotspot locations around point sources. This was since they were not representative of general levels throughout the UK and distorted the observed trend. Concentrations are declining throughout urban and rural areas and are significantly below the standard, and EPAQS recommendation, at locations excluding those adjacent to major industrial sites.

- *Nitrogen dioxide*

Nitrogen dioxide trends are less consistent than those for other pollutants. At urban centre and background locations annual average concentrations are declining. At suburban, industrial and rural and remote sites there has been no significant change. Concentrations at the single kerbside location declined during the early 1990s but have increased subsequently. Overall there has been a modest reduction in urban areas as a whole in annual average concentrations and a larger decrease in maximum 1-hour values.

The national annual average standard is presently exceeded in most urban and suburban areas. In London, which experiences the highest concentrations, levels are approaching double the objective (36 ppb at Bloomsbury). The current downward trend will need to significantly accelerate if the objective is to be met in most urban areas, particularly since the present trend is least at the most polluted sites. The 1-hour nitrogen dioxide objective is more widely met than the annual average value. With the present declining levels the objective is likely to be met at most urban locations in the UK by 2005. Major urban centres are likely to breach this value.

- *Ozone*

There is no statistically significant trend in ozone concentrations at either urban or rural locations. In urban areas, the indicator demonstrates the objective has been met in every year since 1988. In rural areas, the composite average value has oscillated around the 50 ppb standard value since 1987. This demonstrates a large number of rural sites are presently breaching the objective level. Unless concentrations decline significantly by 2005 there are likely to be widespread exceedences of the ozone objective in rural locations.

- *PM_{10}*

There has been a modest reduction in urban annual average PM_{10} concentrations since 1992 (1 $\mu g\ m^{-3}$ pa). There is no statistically significant trend in the daily average values and virtually every site in the UK has exceeded the objective every year since monitoring was initiated. At the most polluted locations the objective is presently exceeded by in excess of a factor of three. On this basis the objective is likely to be exceeded throughout urban areas in 2005, at many sites by a considerable margin.

- *Sulphur dioxide*

Annual average sulphur dioxide levels have fallen since 1990 at an average rate of 1.5 ppb pa. The composite average value for urban areas throughout the UK is now significantly below the WHO Guideline and few sites exceed this value. The short-term, 15-minute average, sulphur dioxide trend is similarly downward on average 20 ppb pa in the 99.9th percentile values. The composite average value is now below the standard, but a large number of sites still exceed this value. The most polluted sites, in Belfast, massively exceed the objective. Assuming the present trend continues the number of sites exceeding the objective by 2005 is likely to be relatively small.

- *Overall Pollution levels and indicator*

A key question is whether air pollution levels in the UK are improving overall or not? The results presented in the study suggest generally declining levels for most pollutants. There has been no change in urban PM_{10} and rural ozone and these are the pollutants for which exceedences of standards are most widespread and frequent.

There is no objective way to combine pollutant *concentrations* to give an overall air pollution index which would reflect the health impact of a cocktail of pollutants. It is possible to generate an overall air pollution trend based upon the DETR's new air pollution *banding* system. Employing the new public information system, for each monitoring site on each day, the level of pollution is characterised by the pollutant for which the unhealthiest concentrations are recorded. It is therefore possible to calculate the days in each year of moderate, high or very high air pollution at each site. Aggregating data on the number of days from all sites would enable an overall air pollution trend to be constructed.

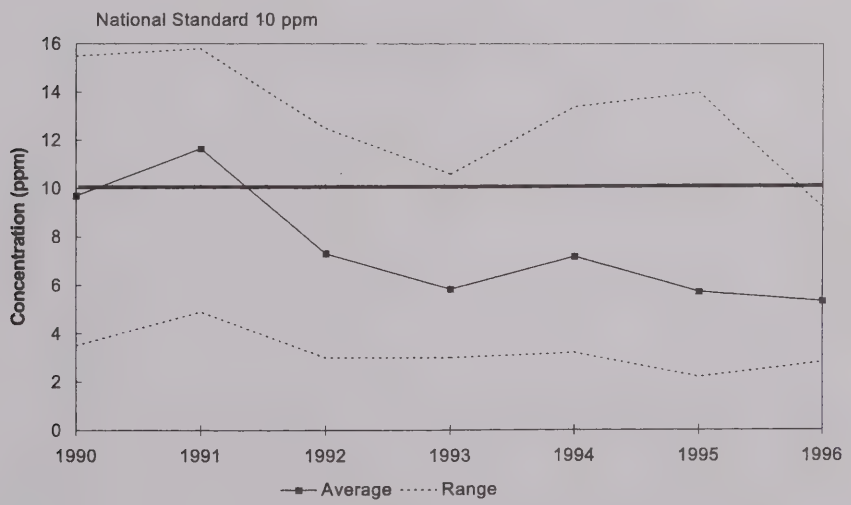
The overall aggregate air pollution indicator has been proposed as one of a small set of headline indicators designed to capture the public's attention and promote recognition that the way we live and do business all influence our environment. It is hoped they will be reported regularly on the evening TV news, alongside the key economic indicators. The DETR has recently commissioned WS Atkins Environment, in association with NETCEN, to produce an overall pollution indicator. The study is due for completion in the autumn.

Acknowledgements

The authors would like to acknowledge the assistance of the DETR who funded the research; and the National Environmental Technology Centre for provision of the data. We would particularly like to thank the Project Officer, Mrs Dorothy Salathiel of EPSIM Division, DETR for her helpful comments and editing of the report and this paper.

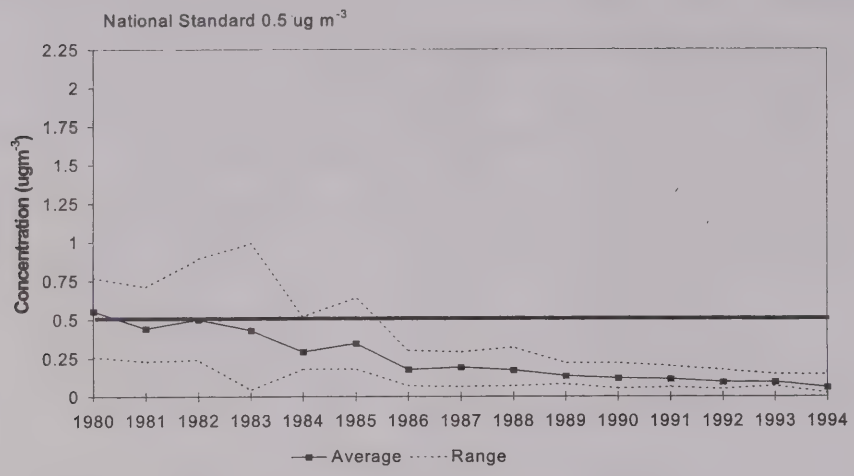
The views expressed in this report are solely those of the authors.

Figure 1 - Urban peak carbon monoxide



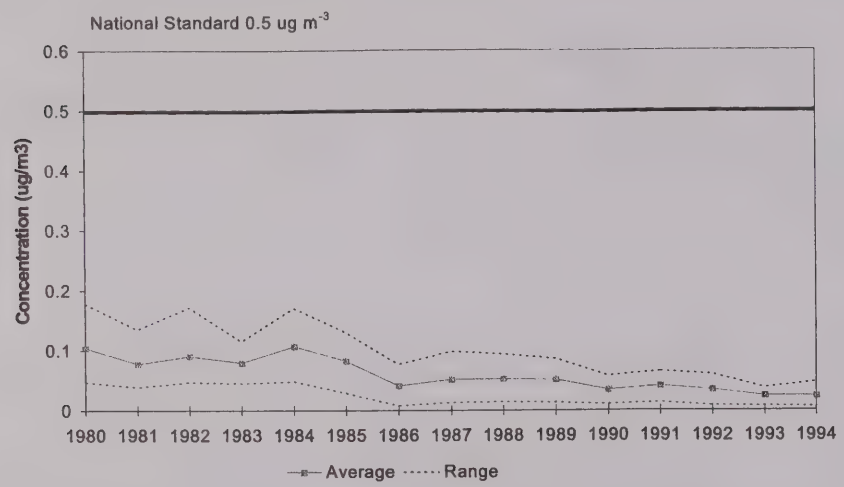
Trend shown is for the maximum running 8-hour average

Figure 2 - Annual average urban lead trends



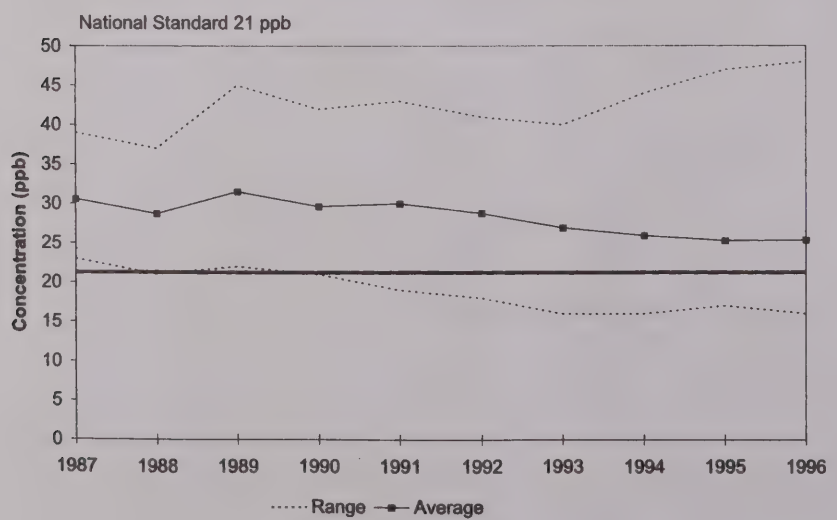
Trends are annual average concentrations. The aggregate data excludes sites located in Urban Industrial and Kerbside locations. EPAQS recommendation 0.25µg m^{-3}

Figure 3 - Annual average rural lead trends



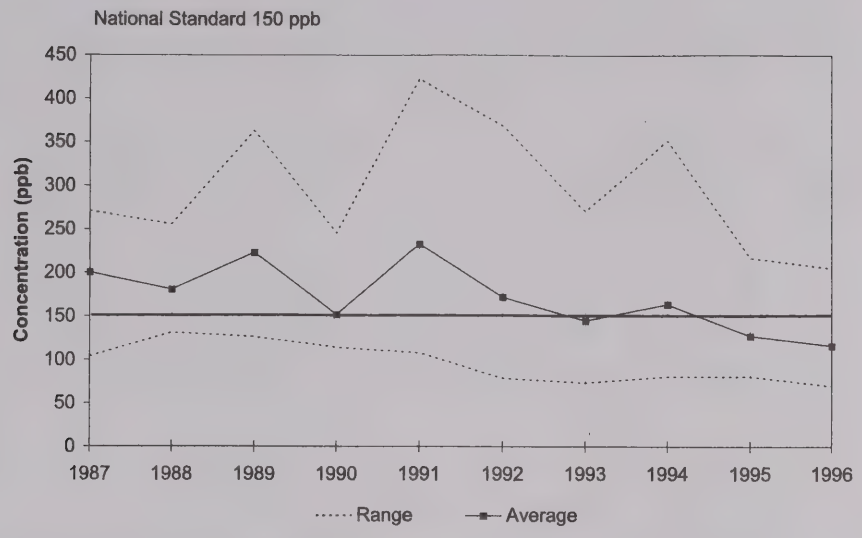
Trends are annual average concentrations. EPAQS recommendation 0.25µg m^{-3}

Figure 4 - Annual average urban nitrogen dioxide trends



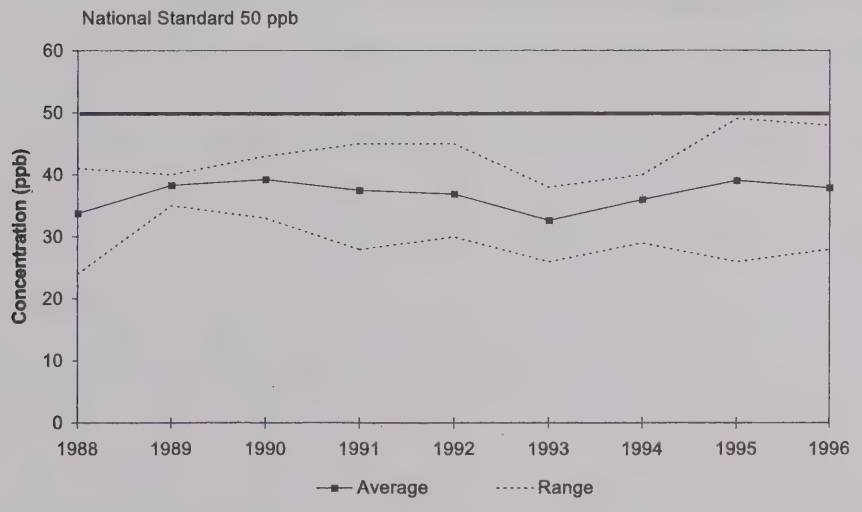
Trends are annual average concentrations.

Figure 5 - Peak urban nitrogen dioxide trends



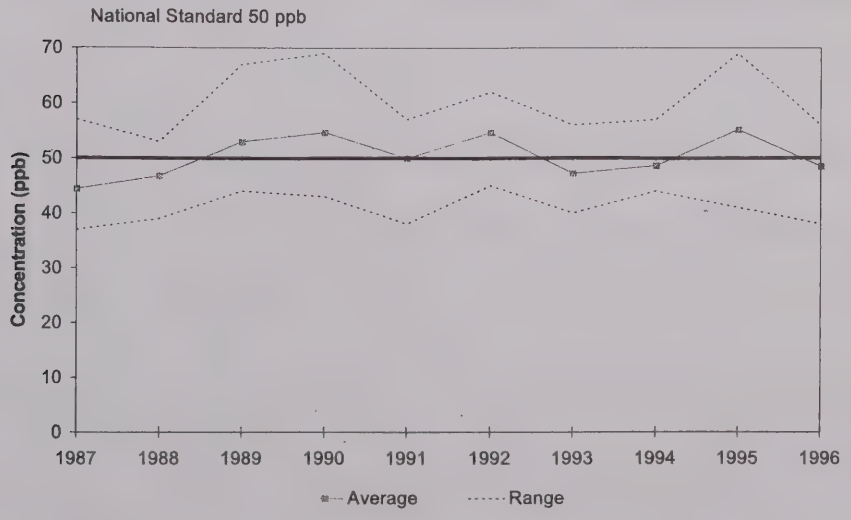
Trends are maximum 1-hour concentrations

Figure 6 - Peak urban ozone trends



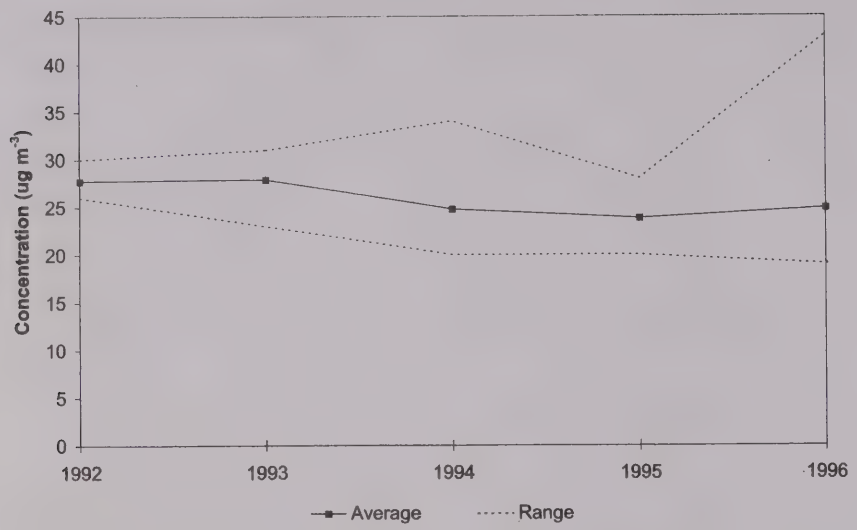
Trend is the 97th Percentile 8-hour running average for all classes of urban sites

Figure 7 - Peak rural ozone trends



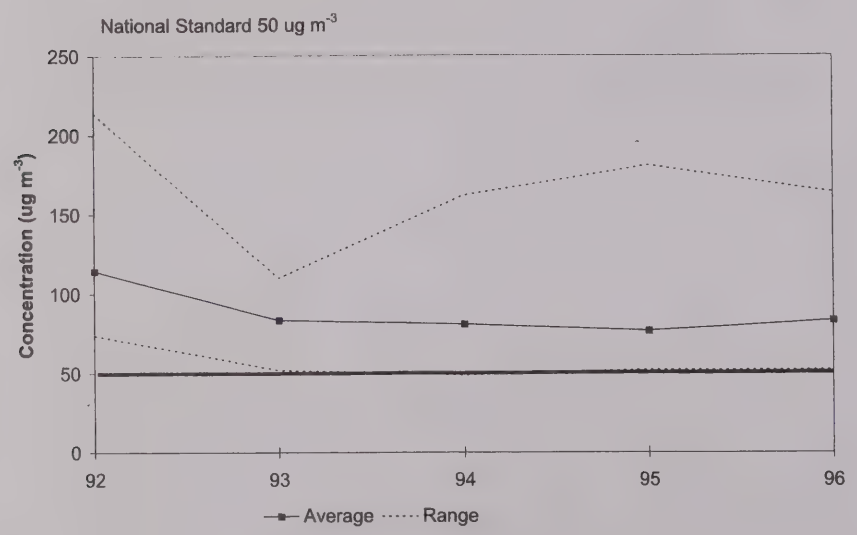
Trend is the 97th percentile of the running 8-hour concentration. Aggregate of Rural and Remote sites

Figure 8 - Annual average urban PM_{10} trends



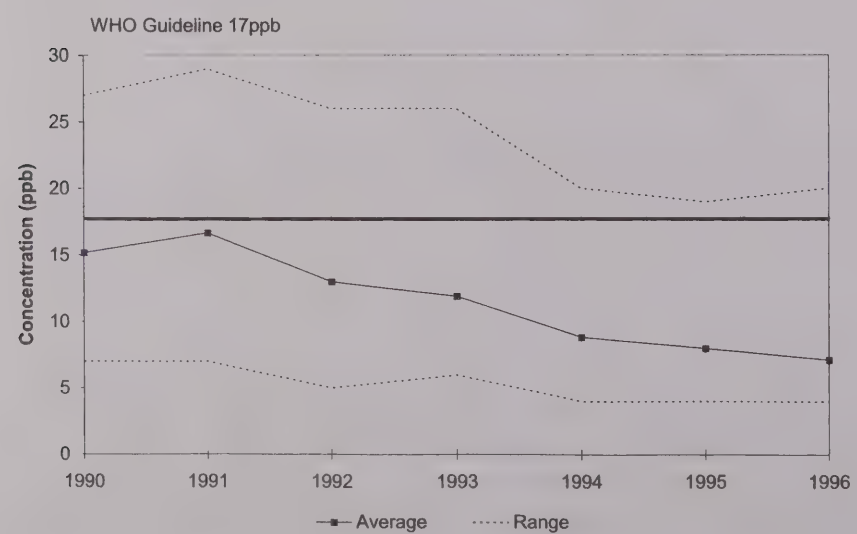
Trend is the annual average. Since this analysis was carried out, the annual average concentration for Belfast in 1996 has been revised from 43 µg/m³ to 24 µg/m³, making the highest concentration in this year 30µg/m³.

Figure 9 - Peak urban PM_{10} trends



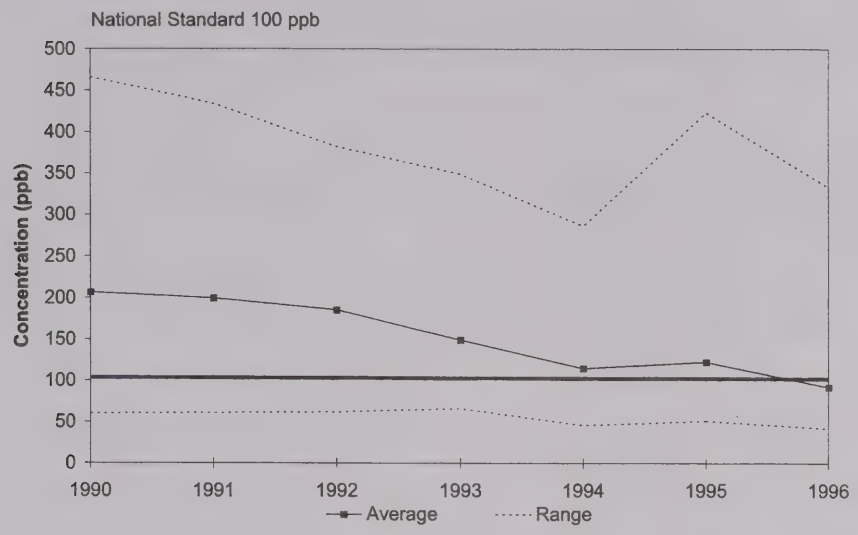
Trend is the 99th percentile of the running 24-hour average values

Figure 10 - Annual average urban sulphur dioxide trends



Trend is the annual average value

Figure 11 - Peak urban sulphur dioxide trends



Trend is the 99.9th percentile of the 15-minute average concentrations

Headstart School Initiative Campaigns in key settings Hampshire County Council, UK

Hampshire County Council

This paper summarises the development of Hampshire County Council's Headstart community involvement programme with local schools and summarises the wider background research. This paper was used as the basis of a presentation made by Tony Ciaburro, Head of Transportation Planning, Hampshire County Council, to NSCA's recent seminar "Public Information and Air Quality". There is a more comprehensive record of the whole campaign in the "Headstart Transport Awareness and Community Involvement Programme".

Introduction

In late 1993 Hampshire, like the rest of Great Britain, was experiencing a dramatic rise in personal car use and projections indicated that the demand for road space would exceed supply on 46% of the network by the year 2011. Recognising the environmental and social costs of continuing to build new road capacity to meet future growth, the County Council began to look for ways of building a more sustainable approach to personal transportation.

Research showed that while people did not generally link their own personal behaviour and travel habits to the existing traffic problems, there was a general acknowledgement that a significant percentage of their journeys were either unnecessary or could easily be accomplished without using their car. It was felt that this area offered scope for influencing travel behaviour through a programme of awareness raising.

Initially a publicity campaign was designed using posters, leaflets and other forms of advertising, encouraging people to **choose** to do something now rather than be **forced** to take action in the future as the situation worsened. The programme was named Headstart to reflect this message of getting a head start while there was still time. The campaign aimed to move through four steps from **building awareness, gaining acceptance of responsibility**, **changing attitudes** and **taking action** to achieve more sustainable transport in Hampshire.

While the title, message and objectives of the campaign were firmly established, the method adopted was changed to focus instead on a programme of community involvement. PDA International, a consultancy specialising in this approach, helped to develop the subsequent Headstart programme. At its core is the concept of bringing people together from various parts of the community to build their personal ownership of the problem and the solution. The programme particularly targeted individuals who were part of community groups and networks so ensuring that that the message was dispersed more widely into the population.

Over 130 community workshops have been held to date, involving businesses, schools, community networks and special interest groups. Around 20,000 people have been directly and indirectly involved in the programme. Over the last four years of the programme there has been a gradual increase in the integration of different sectors of the community that have been involved and a focusing onto specific problem areas. Projects have included the development of area transport strategies and have tackled areas of particular concern such as the effect of transport and traffic on schools and businesses.

Hampshire

Hampshire is located along the south coast of England and is the largest shire county in the country. In 1993 it had a population of around 1.6 million people concentrated in the coastal cities of Portsmouth and Southampton which have recently become unitary authorities as a result of a review of local government structure.

Hampshire has experienced a dramatic rise in personal car use, increasing more than ten-fold since 1950. In Hampshire levels of car ownership, car use and traffic flows exceeded national averages by a significant level, in part due to its prosperity and its attractive natural landscape within commuting distance of London. Hampshire County Council's budget for 1992/93 was £1,225 million of which £92 million (8%) was allocated to expenditure on highways, and £20 million for transport. This compares with 10% allocated to social services, 12% on policing and 57% on education.

By 1993 the County Council had already developed a leadership position in developing and promoting integrated transport strategies, moving away from accommodating increasing traffic levels and towards managing the demand.

The Problem

For the period 1979-1989 the number of licensed vehicles in Hampshire increased by 32% compared with increases of 29% for the whole of the South East region and the rest of Britain. Studies carried out in Portsmouth and Southampton, the two largest urban areas in Hampshire, showed a continued erosion in the percentage of journeys taken by public transport over the same period, down to 26% from 35% a decade earlier in Portsmouth and down to

30% from 35% in Southampton.

Parental fear about traffic danger is a key reason why parents drive their own children to school, though ironically with little regard to the effect this has on other child pedestrians and cyclists. Road accidents are the leading cause of death for school-age children. On Hampshire roads in 1996, 19 children under the age of 16 years were killed.

The impact of school traffic on the highway network is dramatic. As many as one in five peak hour car journeys are involved in a school trip. Many of Hampshire's roads are near capacity at peak times and congestion, with all the associated social and economic impacts, is becoming an every day occurrence. National road traffic forecasts suggest that around half of all main roads in Hampshire will be over capacity and drivers will be experiencing severe delays by the year 2011. There are clearly many potential benefits in reviewing how school journeys are made and this area of work is a natural, and popular, progression of the Headstart programme.

The proportion of children being driven to school continues to rise. In 1971 80% of 7 to 8 year olds went to school unescorted, today this is less than 10%. The threat of personal attack or abduction is often cited by parents as a reason for driving their children to school but the danger from traffic is regularly quoted as a barrier to allowing pupils to make their own way to school on foot or by bike. The UK has a child pedestrian accident rate some 30% higher than other European countries and so the journey to school has become a focus of attention. Parents are clearly driving their children to school for fear of traffic accidents and in turn they are making the congestion and safety situation worse. This cycle of decline needs to be broken if future generations are to become less car dependent.

Concepts and Theories

The approach taken in the Headstart programme reflects two important concepts learned from work with local communities around the world.

The first concept, was that long term shifts in individual behaviour required people to build their own personal ownership of both the problem and the solution. This required that people:

- make a personal link between the problems being described and their own life experience;
- find evidence to indicate that the problem is not only serious, and deserving their attention, but is increasing at such a rate as to become a major threat to their own quality of life and that of their family and community, if not addressed;
- recognise that the right kind of action taken by themselves and others, will impact the problem and go some way towards resolving it (in other words that individual action would make a difference).

The second concept is that every community was not only made up of individuals and families, but also comprises a very large network of community groups and organisations whose members have a common interest that brings them together. The design of the Headstart programme involves aligning the goals and interests of the programme with those of the group.

The central theme of a community involvement programme is a participative approach to involving the community in identifying what transport issues affect them, and how they can be involved in designing and implementing solutions to identified problems. Community based workshops can be used as the first step for communities starting to work together to identify and implement solutions.

Schools have an impact on and are influenced by the whole community. By using the Headstart methodology, all stakeholders can be brought together to consider how the journey to school can be improved. Stakeholders include pupils, parents, teachers, governors, local residents and public transport providers and they can all play a part in finding solutions which will benefit the community.

Focus on Schools

The Headstart Programme continues to evolve. It has gone through the pilot phase to awareness raising to integrated transport strategy development to encouraging community action and focusing on schools and businesses.

There is a rising national concern about children's

journeys to and from school in a number of respects. These arise particularly from concerns about children being driven to school and hence:

- having less experience of road safety situations;
- child pedestrians being more exposed to injury on the road;
- getting less exercise;
- being prone to asthma and other respiratory problems;
- forming car dependent lifestyles.

Meanwhile, other drivers just complain about the additional congestion.

Nearly all schools in Hampshire experience chaos for half an hour twice a day. Pedestrians, cyclists, buses and cars are mixed together in a peak of activity, often in unsuitable or inadequate environments. Traffic around the school site is of concern to many parents and is often high on the list of school priorities. For this reason schools frequently contact the County Council as highway authority asking for help. Road safety improvements and road safety education is provided in many cases. However, significant progress towards lasting solutions can only be made when the school itself is willing to take ownership of some of these problems and work in partnership with others to find solutions. Therefore, Council resources have focused on schools where there was a real desire to get involved.

Implementation

In order to use limited resources in the most effective way, pilot schools were identified. The work in these schools will act as guidance and inspiration to others. These schools were suffering severe transport related problems and recognised that they could contribute to the solution. Pressure from parents or residents, severe congestion, personal injury, accidents or the need to expand their sites, prompted the schools to start considering a different approach. While it would be impossible to devote time and money to detailed discussions with every school in Hampshire it was hoped to publish generic advice for all schools based on this initial work.

A small team of County Council, Transport Policy officers and independent facilitators was formed to work with the chosen schools. This work complemented but was separate from the Council's road safety education programme.

Horndean School

Horndean Community School and one of its feeder primary schools lie approximately 400 metres apart in a well established but expanding residential area. The expansion of the local population has put greater pressure on the Community School, which already provides for over 1,700 children, to expand. However, this has raised concerns that the school could generate more car traffic in a residential area where there are already road safety and amenity concerns.

A phased expansion plan has been granted planning permission subject to the school preparing and implementing a School Transport Plan, which contains specific proposals to discourage car use to the site and encourage alternative modes. This plan has been developed using the Headstart methodology as a key means of consultation and participation with pupils, staff, parents, governors and local residents.

Hampshire County Council is also working in partnership with Sustrans, the cycling and civil engineering charity. Sustrans are using Horndean School in a national demonstration project which is seeking to raise awareness of the problems associated with the journey to school and encourage pupils, parents and staff to reduce car use - through the provision of appropriate physical and educational measures to provide safer routes. It is vital to involve the whole school community in this process. This project includes a full monitoring programme.

The aims of this Safe Routes to School project are to:

- reduce accidents and fear of accidents, around the school;
- improve children's health and fitness;
- encourage less car dependency and promote a cycling and walking culture;
- encourage a modal shift from car use, thus reducing traffic, danger and pollution levels in the vicinity of the school; and
- disseminate experience and ideas to other local authorities and schools nationally.

Facilitators ran brainstorming workshops with parents, pupils, staff, governors and residents to raise and prioritise present issues and future solutions to the transport and traffic problems associated with the school. These workshops informed and guided the development of the transport plan and prompted a series of school projects based around sustainable transport issues and forming part

of the national curriculum. Following the workshop programme, a series of initiatives were investigated including creating cycle routes to school, offsite traffic management and car sharing networks.

The Horndean School Transport Plan was launched in September 1996 and seeks a 20% modal shift away from car use on the trip to school. The key components of the plan are:

- to provide secure cycle parking facilities at the school;
- install traffic calming measures to reduce vehicle speeds and provide separate routes for cyclists and pedestrians on the campus;
- limit car parking spaces and encourage car sharing.

These proposals are supplemented by a package of County Council and developer funded measures which will:

- provide and sign safe and convenient routes for pedestrians and cyclists;
- provide traffic calming measures on surrounding roads to reduce vehicle speeds;
- in association with bus operators, provide improved and more conveniently timed services together with better service information.

Cams Hill School

Cams Hill School is a comprehensive school with a roll of approximately 900 students, lying about 1 mile east of Fareham Town Centre. Along with Horndean, it is included in the Safe Routes to Schools national demonstration project in Hampshire. Attention has been focused on Cams Hill school because:

- it lies adjacent to a busy ex-trunk road, the A27, which reduces the number of routes considered as safe;
- it is isolated from much of its catchment area in Fareham by an extension of the A27 linking to the M27 and, in particular, by a major high risk accident location which intimidates cyclists and pedestrians of all ages;
- the school is keen to actively participate.

An approach similar to that at Horndean has been adopted to developing a school transport plan for Cams Hill. Headstart workshops have been held with all stakeholders and the plan is progressing. Surveys of children's transport behaviour and perceptions have already been completed. Pupils across the school were asked about their existing and preferred modes of travel to school. In addition, all of the 180 12 to 13 year old pupils were asked to complete a more detailed questionnaire giving information about travel patterns, safety, health and fitness, and routes used. The proportion of cyclists, 10% of the school, is already more than twice the national average (which is 4% of 11 to 15 year olds). Yet this represents

only half the number of pupils who would like to be able to cycle to school. A school steering group meets every term, with representatives of pupils, teachers, governors, parents, the County Council, Fareham Borough Council and Sustrans, to progress the plan.

Romsey School Transport Plan

This project began because many parents had concerns about road safety outside the school. The project has gone on to look at longer term transport and traffic planning issues and has involved other schools in the town. The County Council's attention was focused on Romsey School following an analysis of accident records in the immediate area. Between September 1994 and August 1997 there were 15 personal injury accidents on roads adjacent to the school (Greatbridge Road and Duttons Road). Of these accidents, seven appear to involve children on journeys to school. The accidents were scattered over local roads rather than clustered around one problem area.

Following a meeting with parents, County Council officers investigated some infrastructure that could help alleviate the immediate road safety concerns in the short term. A phased package of low cost road safety measures is currently being implemented. However, the accidents are merely symptoms of a much larger problem. The school is served by a number of busy, congested roads with narrow footways and limited crossing facilities. It is very much a car dominated environment. The school is a major part of the Romsey community and could significantly contribute to improving transport systems within the town by reviewing its transport options and policy.

The aim of this project was to work with the local school community to produce a School Transport Plan. The Plan would outline measures that could be taken by parents, pupils and staff to reduce congestion, improve road safety and encourage more children to travel to school by means other than the car. This would clearly demonstrate commitment from the local community to play its part in resolving transport problems. It could then be used to support local authority submissions for funding for

infrastructure measures to be used in conjunction with and complement the community led actions.

At the same time the school carried out a survey of current travel patterns by circulating a Travel to School questionnaire to its staff, pupils and parents. The survey was analysed by an interested parent. There was a very good response to the survey, 357 responses from parents, 368 from pupils and 37 from staff. Some of the initial findings of the survey are set out below:

- most pupils live in excess of one mile from the school;
- most staff live over three miles away;
- the peak time for arrivals at the school is between 8.25 am and 8.45 am;
- the main concerns of parents and pupils relate to bus services;
- buses are thought to be overcrowded and expensive and do not cater for departure for school after 'after school activities';
- parents would be prepared to allow their children to walk to school on safe routes;
- parents would allow children to cycle on safe routes if lockers were provided for equipment;
- 35% of pupils are driven to school;
- 86% of staff drive to school;
- 60% of pupils attend after school activities;
- Pupils leave at 4.00 pm (5.00 pm if attending activities);
- Many parents arrive in their cars early in the afternoon from 2.00 pm to 2.55 pm to collect children causing congestion around the school and local residential areas.

As the safety measures were being implemented, a wide cross-section of the community took part in a series of three transport planning workshops. These included governors and staff, parents and pupils of Romsey School, local residents, transport police, transport operators, local authority officers and staff or governor representatives from several of the other schools in Romsey. Participants in the workshops worked together on a series of tasks to begin to outline a realistic and achievable future transport plan for the school and surrounding area. They began by considering past and future trends in traffic and transportation that had or would influence their school. They looked at current issues and concerns and discussed what was within the scope of this initiative.

In the meantime officers held three workshops with pupils to gain their input into the School Transport Plan and to convey information about the road safety measures currently being implemented around the school. Pupils from year 7 (11 - 12 year olds), year 9 (13 - 14 year olds) and year 11 (15 - 16 year olds) took part in the workshops. They were enthusiastic and constructive in their approach.

Participants discussed the Travel to School survey and the implications of the results. Discussion then focused on solutions and ideas for the future and consensus was reached on a variety of priorities. Ideas and opportunities were sought to achieve this through joint action. The following list of priorities was agreed.

Parking and Dropping Off
- School buses / ride and walk
- Park and Ride
- Better drop off and pick up areas
- No parent parking close to school at drop off point
- No cars outside school
- Car free zones at set times

School Issues
- Start earlier, finish earlier
- Lockers for pupils
- New teaching methods - computer learning

Traffic Management
- Variable speed limits

Routes
- Pedestrians and cyclists have priority
- Crossing points
- Better access to school
- Link to Mill Lane - make safe to use

Town Issues
- Free public transport within Romsey
- Romsey car free zones
- Outskirt car parking

General Issues
- Lobbying for national transport policy
- More people working from home.

At the end of the workshop programme a decision was made by participants to meet in small working groups to progress ideas and complete a draft of the Plan by May 1998. The initiative continues to make good progress.

Involving representatives from seven other schools in Romsey and key figures in the town has enabled the Headstart message and its partnership approach to be widely appreciated in the community. As a consequence, solutions which require the collaboration of other schools are being considered by participants.

Monitoring and Evaluation

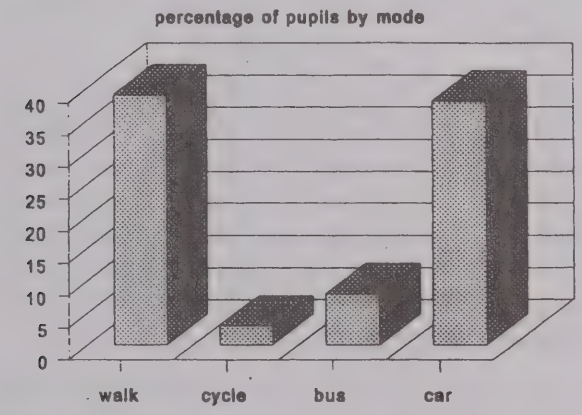
Evaluation of the Headstart programme has been undertaken on an intermittent basis since its inception. The evaluation surveys suggest that there is certainly evidence of awareness of the Headstart programme. However, the inevitable question arises as to whether it is successful in meeting the initial objectives of: raising levels of awareness, enhancing peoples acceptance that there is a problem, changing attitudes and leading to action which reduces car use.

The success of the Headstart schools initiative can be measured by the following key indicators:

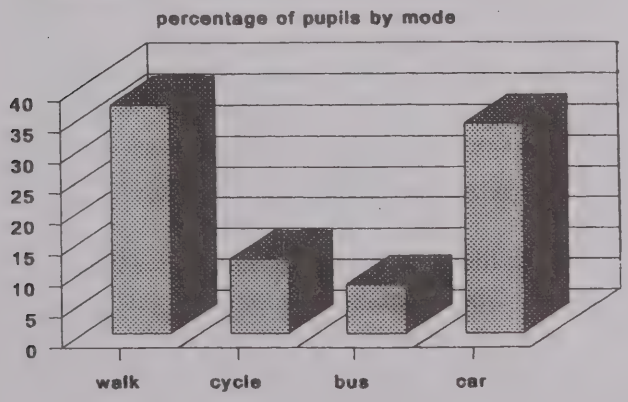
- a reduction in the number of car journeys to and from the school;
- an increased proportion of journeys to and from the school made by energy efficient modes such as public transport, walking and cycling;
- greater awareness of transport issues and the impact of traffic on the environment on the part of pupils, staff, parents and the local community;
- potentially reduced road casualty figures;
- greater participation in transport related projects within the school curriculum.

At Horndean Community School, where the Headstart process and the transport plan are most advanced, benefits can already be seen. An annual monitoring programme has been designed which includes traffic counts, attitudinal surveys, cycling and walking surveys and a repeat of the original school questionnaire survey. One year on and the repeat Horndean surveys are being analysed but initial results are positive. There is a clear increase in cycling and an encouraging decrease in car trips.

Horndean - 1996



Horndean - 1997



Two years ago only 30 pupils out of a total of 1700 cycled to Horndean Community School in East Hampshire and at either end of the school day entrances and school grounds were choked with cars. Today 120 children regularly cycle to school and lock their bikes to new secure bike sheds, monitored by television cameras. Congestion is much reduced as many parents drop their children off 1/2 mile away and no longer drive into the school grounds. These changes are the result of a series of new ideas and initiatives produced as part of the Horndean's School Transport Plan.

A combination of improved safe cycling and pedestrian access and continued awareness raising in the school has resulted in a four fold increase in the number of children cycling to school over two years. The potential of safe cycle routes was further demonstrated in June 1997 when the numbers cycling to school increased to 270 during National bike week. Additional improvements are now ensured since funds of £100,000 have recently been secured from a Hampshire County Council TPP (Transport Policies and Programmes) bid to install cycle lanes and other safe routes provisions, as a result of the involvement of the Headstart programme in 1996.

News of the school's significant success has travelled across the county. Horndean Head teacher Geoff Crane heard Sir George Young, the then Transport Minister, refer to the school at a transport conference in 1997, "It was a source of great pride for me when the minister said how he had been impressed by pupils' efforts during a visit to Horndean School".

Evaluation of individual Headstart projects by participants provides extremely valuable feedback as to the effectiveness of the programme in raising awareness and changing attitudes and behaviour to car use. It also reflects the many spin-off benefits that can be achieved by the County Council working in close partnership with its local community.

Towards the end of the Romsey School Transport Plan initiative participants were asked to fill in a feedback form assessing their views of the process in which they had been involved. To highlight the diversity of the direct and indirect influence of this process, some responses to the question "What have you valued most about this involvement process? Why was this?" are given below:

"Giving pupils' input into the safety of myself and other pupils. It's ultimately going to affect us so being a part of decision making is important" *Pupil.*

"The fact that the pupils' views and insight is being taken into account and our first hand experience is being used of what road safety is like at school" *Pupil.*

"The broad spectrum of people involved and the level 'platform' upon which discussion took place to achieve a common end" *Public transport provider.*

"The mixture of experiences, views, knowledge of parties present in the consultation is the way forward" *Parent.*

"Involvement of all sectors in workshops and different needs and expectations" *Parent.*

"To have one's say" *Local resident.*

"Constructive approach to problem solving" *Local authority officer.*

Solutions suggested by the public throughout the Headstart programme have been both innovative and realistic. They are realistic because they are based on consensus (for example opening up new routes to Romsey School) and innovative because they result from the combined perspectives of a broad cross-section of the public.

Key Lessons and Future Plans

Progress within schools is largely dependent upon identifying enthusiastic individuals within the school community. In Romsey there are several motivated parents who are driving the transport plan forward. In Horndean the Headteacher is championing the Headstart cause and in Cams Hill the pupils are the most enthusiastic group. Progress has been slower at Cams Hill because the teaching staff are cautious of this new approach and reluctant to get involved. Without the support of teaching staff, any amount of advice and guidance through publicity and information packs will be of very limited value. Advice from schools suggest they are inundated with information which usually ends up in the school library without being acted upon. By running workshops and initiating project work, transport issues can be effectively introduced into pupils' project work without adding an extra burden to busy teachers.

The future objectives of the Headstart Schools initiative for the year 1998/99 include:

- Building on last year's successful transport initiative at Romsey School, a challenge will be made to the school to involve other schools and other sectors of the town in a Romsey-wide action programme to achieve a reduction in car use.
- Target another school, or group of schools, to develop a school transport plan that could lead to a Transport Policies and Programmes bid for safe routes improvements, similar to that obtained by Horndean School following the 1996 Headstart programme.
- Provide a set of generic advice for Hampshire schools on how to develop a school transport plan.

The future of the Headstart programme will be built on extending action through significant communities of interest, so as to build successful examples that the public can relate to as transportation issues become more evident. The focus of the Headstart programme in 1998-99 will be to achieve reduced dependency on the car as a means of transport through **action based projects** with businesses, schools and communities where a problem is already evident.

The Headstart message will be disseminated by **promoting the achievements of the action projects** to a much broader community of interest, through case study examples and guidelines. Communications channels to be used will include the Headstart Review (a newsletter about the programme), technical and professional media and local media. Council members committees will be encouraged to endorse the promotion of the programme.

All programme elements are consistent with Transport Policy's planned focus of activity in 1998-99. The programme elements will build on the success of previous activities, but will include new elements to address emerging needs. The achievements of each project will be measured on the basis of a series of qualitative and quantitative criteria including project appraisal by officers, Council members, project participants and consultants evaluation.

UPDATE

CLEANER AIR FOR EUROPE

Key measures aimed at improving air quality throughout Europe were agreed during the UK's Presidency of the European Union, including the first Daughter Directive under the air quality assessment and management Directive, Directives on vehicle emissions, fuel quality and the sulphur content of liquid fuels.

Air Quality Standards

The last Environment Council meeting of the UK's Presidency of the EU agreed a Common Position on the first Daughter Directive to be proposed under the 1996 ambient air quality assessment and management Directive. This sets legally binding limit values for concentrations of sulphur dioxide, nitrogen dioxide, particles and lead in air which must be complied with by 1 January 2005 (1 January 2010 for NO_2) - see box. The Directive, which now returns to the European Parliament for a second reading, is expected to be formally adopted later this year and will come into force two years later. Many of its requirements are similar to those of the UK's National Air Quality Strategy: air quality must be assessed; where the limit value is likely to be exceeded on more than the permitted number of days then action programmes setting out plans to meet the limit value by the target date must be drawn up; where the limit value is exceeded, steps must be taken to ensure it is met by the target date; where air quality is below the limit value, it should not be allowed to deteriorate.

Up to date information on ambient concentrations of all the pollutants must be made available to the public, including information on any exceedances. Alert thresholds requiring public warnings to be issued, have been set for sulphur dioxide (500 µg/m³) and for nitrogen dioxide (400 µg/m³), both measured over three hours.

Further Daughter Directives are to be proposed covering ozone; benzene and carbon monoxide; and PAHs, cadmium, arsenic, nickel compounds and mercury.

Vehicle Emissions & Fuel Quality

The European Parliament and Council of Ministers have reached agreement on several Directives proposed under the Auto-Oil Programme.

The first Directive, covering passenger cars and light duty vehicles (vans) (originally two separate Directives) requires a reduction in emssions for petrol engined vehicles of 30-40% and for diesel engined cars of up to 50%; these reductions will be implemented between 1 January 2000 and 1 January 2002, with a further stage of reductions planned for 1 January 2005. The Directive also introduces on-board diagnostics systems for petrol cars and the smallest vans from 1 January 2000 and for diesels from 1 January 2003.

New EU Air Quality Standards

Sulphur dioxide

- hourly limit value for the protection of human health: 350 µg/m³, not to be exceeded more than 24 times per calendar year; target date: - 1 January 2005.
- daily limit value for the protection of human health: 125 µg/m³, not to be exceeded more than 3 times per calendar year; target date: 1 January 2005.
- Alert threshold: 500 µg/m³ measured over 3 hours.
- annual limit value for the protection of ecosystems: 20 µg/m³; target date: 2 years after Directive enters into force.

Nitrogen dioxide

- hourly limit value for the protection of human health: 200 µg/m³, not to be exceeded more than 18 times per calendar year; target date: 1 January 2010.
- annual limit value for the protection of human health: 40 µg/m³; target date: 1 January 2010.
- annual limit value for the protection of vegetation: 30 µg/m³; taret date: 2 years after Directive enters into force.
- alert threshold: 400 µg/m³ measured over 3 hours.

Particulate matter (PM_{10})

- daily limit value for the protection of human health: 50 µg/m³, not to be exceeded more than 35 times per calendar year; target date: 1 January 2005.
- annual limit value for the protection of human health: 40 µg/m³; target date: 1 January 2005.
- (indicative) daily limit value for the protection of human health: 50 µg/m³, not to be exceeded more than 7 times per calendar year; target date: 1 January 2010.
- (indicative) annual limit value for the protection of human health: 20 µg/m³; target date: 1 January 2010.

Lead

- annual limit value for the protection of human health: 0.5 µg/m³; target date: 1 January 2005.

The second Directive reduces the maximum allowable sulphur content of petrol by 70% and for diesel by 30% from 1 January 2000. From 2005 these figures will reduce further by 66% and 71% respectively, representing overal reductions in both petrol and diesel sulphur of 90%. The benzene content of petrol is cut by 80%.

Sulphur Content of Liquid Fuels

This Directive, on which a Common Position was reached at the end of June, will result in the sulphur content of heavy fuel oil being reduced to 1% from 2003; the sulphur content of gas oil (used mainly in small industrial and domestic boilers) is to be reduced to 0.1% from the current 0.2% by 2008.

EPAQS TO STAY

In a written Parliamentary answer, Environment Minister Michael Meacher said that following a review, it has been decided that the DETR will continue to sponsor the Expert Panel on Air Quality Standards. He said that EPAQS remained the best placed to provide advice on new evidence emerging on the effects of air pollution and on the pollutants not yet considered by the Panel. The DETR will, however, now be reviewing the future operation of the Panel, including its membership, working procedures and its work programme for the next five years.

CLIMATE CHANGE

Launched on World Environment Day (5 June) by Michael Meacher, *Climate Change - Impacts in the UK** outlines the rationale and scope of the UK Climate Impacts Programme, which was set up in 1997 at the Environmental Change Unit at the University of Oxford. The report, sub-titled "The Agenda for Assessment and Action" sets out a framework for integrated research on the impacts of climate change - previous studies have looked at the impacts for particular sectors - to be carried out in association with private and public sector organisations. The results of the research will provide valuable data which can then be used to inform decisions on adapting to climate change.

Meanwhile, EU Environment Ministers have agreed on how to apportion the target 8% cut in greenhouse gases to be achieved by the EU under the Kyoto Protocol - the cuts to be made on 1990 levels by 2010 - see *Clean Air*, July/August 1998. The biggest cuts are to be made by Luxembourg (- 28%), Denmark and Germany (- 21% each); the UK has agreed to reduce its emissions of greenhouse gases by 12.5%.

* *Climate Change - Impacts in the UK*, DETR, May 1998

WASTE STRATEGY

The DETR is seeking comments on a National Waste Strategy for England and Wales, with the aim of publishing a draft Strategy early next year. This would set clear goals and provide a blueprint for the future of sustainable waste management policies and practices.

*Less Waste : More Value** outlines seven key commitments which the Government sees as forming the basis of a national waste strategy; these are:

- substantial increases in recycling and energy recovery;
- engagement of the public in increased reuse and recyling of household waste;
- a long term framework with challenging targets underpinned by realistic programmes;
- a strong emphasis on waste minimisation;
- using the waste hierarchy as a guide, not a prescriptive set of rules;
- creative use of economic incentives such as the landfill tax;
- increased public involvement in decision making.

*Available from DETR Free Literature, PO Box 236, Wetherby, L23 7NB; tel: 0870 1226 236. The consultation period ends on 25 September.

SUSTAINABLE AGRICULTURE

MAFF is developing a new range of indicators to assess the impact of UK agriculture on the environment and rural economy. A consultation paper published in June* discusses the theory of indicators and their relevance to agriculture and how they can assist policy makers to assess the environmental effects of their policies and to measure whether UK agriculture is becoming more or less sustainable; a further purpose of the indicators is to raise awareness amongst all those involved in agriculture, and the general public, of the environmental impacts of agriculture and its contribution to sustainable development.

Some 35 indicators are proposed covering a number of themes; these include indicators for measuring the impacts of agriculture on landscape and wildlife, water quality and water use, greenhouse gas and ammonia emissions, pesticide use, soil protection and environmental management systems. It is intended that development of indicators for the agricultural sector should complement DETR's work on developing a new UK sustainable development strategy (Opportunties for Change, published February 1998).

* Development of a Set of Indicators for Sustainable Agriculture in the United Kingdom: A Consultation Document. Available from Mr. G. Beckwith, MAFF, Room 142, Nobel House, 17 Smith Square, London SW1P 3JR. Email: G.Beckwith@env.maff.gov.uk. Closing date for responses 18 September 1998.

EU TRANSPORT MEETING

EU Transport Ministers meeting in Luxembourg in June agreed a range of measures to make air, sea and road transport safer and improve the environment; they include:

- regular roadside inspections of commercial vehicles carrying passengers or freight to ensure that safety and environmental standards are met;
- endorsing action by the International Civil Aviation Organisation (ICAO) to establish worldwide NOx emission rules for new aircraft; should ICAO not make progress, the EU will consider acting at regional level (see *Clean Air*, No. 4, 1998);
- limiting the use of older aircraft using engine 'hushkits' to reduce noise levels.

MEMBERS NEWS

Members! Are we covering your news?
Please check that your press office has *Clean Air* on its mailing list.

Sainsbury's has started selling a new low-emission City Petrol at filling stations in the South East of England. Supplied by **Greenergy,** the fuel has less than 1% benzene and very low sulphur levels. It will cost 2p a litre more than standard unleaded.

City Petrol on sale at Sainsbury's

The **London Borough of Sutton** really went to town on Green Transport Week, temporarily turfing over their own car park to provide a space for leisure activities. The Borough also unveiled its first public electric car charging station and a fast fuelling point for CNG powered vehicles.

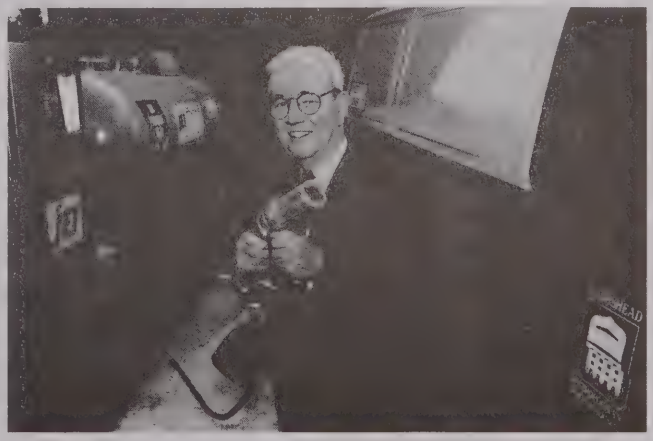
The **UK Petroleum Industry Association** has elected Christian Cleret as its new President. Mr Cleret, Managing Director of Elf Oil UK, says that his mission is to start turning the tide towards a more balanced view of the oil industry and its contribution to modern society.

The **London Borough of Ealing** has invested in a new mobile air pollution monitoring unit which will supplement its two existing monitoring stations. The unit was launched at a seminar on air quality aimed specifically at local businesses. The Council wants to involve business in consultation on air quality management, and hopes to encourage large employers to develop green commuter plans.

Longstanding NSCA member **Dr Michael Schwar** has left **Stanger Science & Environment** to set up his own company, Schwar Consultancy. Mike was scientific adviser to the GLC and is responsible, among other things, for establishing the London-wide Environmental Monitoring Programme. He can be contacted on 01753 854422.

Dr. Mike Schwar

Eight LPG-powered vans will be taking part in a pilot study for **Gateshead MBC,** which is evaluating the use of alternative fuels in its fleet. Cllr Bill Maddison says "The Council is one of the largest transport operators in the Borough, with over 500 vehicles in operation. We have an important role to play in demonstrating to other vehicle operators what can be done to reduce vehicle pollution".



Cllr Bill Maddison fills LPG converted vehicle

Divisional News

At the **South East Division** AGM the following were elected to the Divisional Council: Chairman, F John Smith; Deputy Chairman, Paul Cooney; Hon Secretary, Joe Beagle; Hon Auditor, Phil Thompson; Mrs D Bellerby, Linda Davies, Alfred Dunitz, Rob Gibson, Simon Hickmott, Brian Marsh, Alan Rees, Mike Schwar, Richard Scorer and Lis Solkhon. Linda Davies of Imperial College gave an illustrated talk on biological monitoring for air pollution.

The new Divisional Secretary of the **South West Division** is David Muir of **Bristol City Council**, taking over from Peter Gendle, who has seen the Division go from strength to strength. David is already a member of the NSCA Air Quality Management Committee, and has been working with other members of the Division on plans for this year's conference at Weston-super-Mare.

The **Scottish Division** recently held a successful training seminar in Falkirk. Speakers from DETR, the **Atmospheric Research and Information Centre** and **CERC** took local authority pollution officers through the new technical guidance on air quality review and assessment.

The **North West Division** has recruited an Assistant Secretary to work alongside Hon. Secretary Neil Turner. Carol Quinn has an MSc in Environmental Management, and will be devoting time to organising regional seminars, and recruiting new members.

Elsewhere...

Delegates to the NSCA conference *Clean Air for Europe* were treated to some fascinating insights into the air quality problems of major European cities. Gerard Thibaut explained that Paris intends to create special protection zones with more rigorous emission control regulations. Asked how the powers would be enforced, he shrugged philosophically. "This is a city which issues seven million parking tickets a year", he observed.

Clean Air has previously covered the air pollution potential of lawnmowers, but research from the CSIRO Atmospheric Research Division in Australia suggests that cutting grass is also a threat to air quality. Grass naturally gives off small amounts of hydrocarbons, and mowing or trampling grass can increase the emission rate dramatically. In a city, mowing can account for up to 10% of hydrocarbon emissions during the summer, adding significantly to urban smog.

During the first smog of the summer, NSCA's Brighton office received a call from GMTV. Would a spokesperson be prepared to go up to London to do an interview about the terrible problem of traffic pollution? Certainly. Great - we'll send a car for you.

BOOKS

Pollution Control: The Law in Scotland. *C. Smith, N. Collar, M. Poustie. T & T Clark, 1997. ISBN 0-567-00525-9. £38.00.*

This guide to Scottish pollution control legislation is current to 31 March 1997; it covers Integrated Pollution Control and air pollution control under the *Environmental Protection Act 1990*, the control of water pollution and waste on land, statutory nuisance, radioactive substances and environmental information in some detail. The forthcoming contaminated land regime under the *Environment Act 1995*, is also covered in some detail, based on consultation documents dating from September 1996. However, the air quality provisions of the *Environment Act,* which have arguably rather a lot to do with the control of pollution, merit 10 lines, and the *Clean Air Act 1993,* a mere eight. Despite this, this book will be welcomed by practitioners and students alike for its overview of Scottish legislation, as well as its references to European and International measures and to relevant case law.

Health and Environmental Impact Assessment. *British Medical Association. Earthscan, 1998. ISBN 1 85383 541-2. £14.95.*

Aimed at both the general and the professional reader, this report aims to develop the policy of the BMA on health and the environment. It acknowledges that good environments contribute to quality of life and well being, and sets out to demonstrate that an integrated approach to the health and environmental impact of development projects is needed. It gives an overview of recent policy initiatives in environment and health, and looks at cases where health impacts could be integrated into the environmental assessment process.

Thallium in the Environment. *Ed J.O. Nriagu. Wiley, 1998. ISBN 0-471-17755-5. £70.*

Written by a panel of international experts, thallium in the environment covers the history of thallium production and its uses, sampling, analysis as well as examining toxicology and environmental control.

FUTURE EVENTS

31 AUGUST - 2 SEPTEMBER - Urban Transport & the Environment for the 21st Century

Fourth international conference providing an opportunity for the exchange of information among all those working on urban transport studies and those involved with transport policy.

Venue: Lisbon, Portugal.

Details: Wessex Institute of Technology. Tel: 01703 293223; Email: Paula@wessex.ac.uk

13-18 SEPTEMBER - 11th World Clean Air & Environment Congress

The contribution of developing countries to regional and global air pollution is likely to become increasingly significant; while developing countries may take note of environmental management and technology of developed countries, it is important for them to maintain sustainable development. However, the interface between developing and developed countries must bring about the evolution of appropriate international environmental management. Convened by the International Union of Air Pollution Prevention and Environmental Protection Associations (for which NSCA provides the secretariat), and hosted by the National Association for Clean Air, South Africa.

Venue: Durban, South Africa.

Details: Ammie Wissing, PO Box 36782, Menlo Park, 0102 South Africa. Fax: +27 12 348 1563. Email: wissing@iafrica.com

15-18 SEPTEMBER - Environmental Health Congress & Exhibition

Annual CIEH congress with strategic plenary sessions and technical parallel sessions encompassing all aspects of environmental health.

Venue: Harrogate International Centre.

Details: CIEH Events Division. Fax: 0171 827 5868. Email: events@cieh.org.uk

21-22 SEPTEMBER - Incineration of Municipal Waste with Energy Recovery

Two day course providing an introduction for all those considering incineration as an option for the disposal of municipal solid waste; also detailed coverage of the incineration process and asociated problems for those already involved.

Venue: Weetwood Hall, Otley Road, Leeds.

Details: Jenny Bannister, University of Leeds, Dept of Fuel & Energy, fax: 0113 233 2511. Email: shortfuel@leeds.ac.uk

22 SEPTEMBER - Health in the Inner Cities

Two day conference examining the effects of city planning on health, ways to avoid planning pitfalls and promoting strategies for creating a healthy city environment.

Venue: Victoria Hall, Saltaire, Bradford.

Details: Alexandra Rivas-Hidalgo, The Royal Society of Health, Fax: 0171 976 6847. Email: rshealth.org.uk

29 SEPTEMBER - The Environmental Impact Assessment Directive

Held in Association with the Institute of Environmental Assessment, this conference looks at the requirements of the Directive, who it affects and how to deal with the changes.

Venue: Radisson Portman Hotel, London W1.

Details: Sarah Louise Ashmore, IBC UK Conferences, Fax: 0171 453 5476.

8-9 OCTOBER - UK & European Legislation on Air Quality

This conference will look at national and European air regulations, meeting the requirements of the NAQS, EU air quality Directives, providing essential insight from UK and European regulators, local authorities and the power and transport industries.

Venue: The Berners Hotel, London.

Details: Sarah Louise Ashmore, IBC UK Conferences, Fax: 0171 453 5476.

9-10 OCTOBER - Sustaining Environmental Law

This conference will review the many changes and developments in UK environmental legislation which have occurred over the last 10 years and consider how the law can be sustained and developed in the future.

Venue: Imperial College, London.

Details: Sally Verkaik, Centre for Continuing Education, Imperial College, Tel: 0171 594 6882; Email: cpd@ic.ac.uk

29-30 OCTOBER - Air Transport Infrastructure & the Environment

What is the real economic and environmental impact of air transport - airlines, airports, manufacturing and maintenance - on the environment and how can balance be achieved and maintained?

Venue: The Radisson/SAS Portman Hotel, London.

Details: Clive Rigden, Aeronautica Communications. Fax: 0181 893 3796. Email: info@aeronautica.co.uk

1999

16-18 JUNE WHO 3rd Ministerial Conference on Environment & Health

Delegates from more than 51 countries will be discussing and setting the agenda for environment and health for the early years of the 21st century.

Venue: Queen Elizabeth II Conference Centre, London.

Details: Rebecca Lindsey, The Event Organisation Company. Fax: 0171 924 1790; Website: www.event-org.com

FORTHCOMING NSCA EVENTS

Tuesday 15 September 1998
Training Seminar - NEC Birmingham
Noise Update 98

Monday 26 - Thursday 29 October 1998
Annual Conference and Exhibition - Weston-super-Mare
Environmental Protection 98

Tuesday 10 November 1998
Training Seminar - NEC Birmingham
Greenfield or Brownfield?
Environmental Implications of New Development

Thursday 26 November 1998
Workshop - London
UK Dispersion Model Users Group

Thursday 10 December 1998
London
NSCA Centenary Conference and Reception

Divisional Meetings

East Midlands
17 September: Severn Trent Water, Cropston Visitors Centre

Wales
18 September: Council Meeting
16 October: AGM
27 November: Council Meeting
All venues to be confirmed

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 Fax: 01273 735802

nsca

CLEAN AIR
AND ENVIRONMENTAL PROTECTION

November/December 1998

- Local Environment Management - Sustainable Development Strategy
- Local Air Quality Management - Current Practice
- Investigations of Air Pollution at a Road Junction

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CLEAN AIR

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CONTENTS

The National Society for Clean Air and Environmental Protection produces information, organises conferences and training events, and campaigns on air pollution, noise and environmental protection issues. Founded in 1899, the Society's work on smoke control led to the Clean Air Acts. More recently NSCA has been influential in developing thinking on integrated pollution control, noise legislation, and air quality management.

NSCA's membership is largely made up of organisations with a direct involvement in environmental protection: industry, local authorities, universities and colleges, professional institutions, environmental consultancies and regulatory agencies. Individual membership is also available to environmental specialists within industry, local authorities, central government, technical, academic and institutional bodies.

Members benefit from joining a unique network of individuals who share an interest in a realistic approach to environmental protection policy; from access to up-to-date and relevant information; from reduced fees at NSCA conferences and training events. They contribute to NSCA's regional and national activities; to environmental policy development; to translating policy into practice; to the Society's wide-ranging educational programmes.

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(Founded 1899)
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EDITORIAL

Noise Catches Up

Delegates to the Society's Annual Noise Update seminar in September will have noticed that noise policy is suddenly rising up the policy agenda. There seems to be a new interest within Government, perhaps prompted by the noise control framework now being developed at EU level. It has been said that noise policy lags about ten years behind air quality. We are only just beginning to consider the implications of noise mapping; assessing the local noise climate and developing a management approach to reducing exposure to acceptable levels.

The analogies with air pollution can be stretched too far. What often upsets people about noise is not so much the health effects of background noise (although the health evidence is beginning to accumulate for this), but the irritating and occasionally life-threatening problems associated with neighbour noise. This is an area with which local authorities are already familiar. On the whole, most would say that they are happy with the legislative powers available to them, and that the main problem is one of public attitudes and expectation. The Society will continue to work on noise information, and has already held preliminary discussions with the DETR to co-ordinate Noise Awareness Day next year, on 7 July.

Ultimately, noise is a quality of life issue. It is a pollutant which affects people directly, and which benefits from an overall perspective on local environmental management. Measures to reduce traffic, improve housing, encourage local environmental stewardship and community awareness will bring benefits to the noise climate as well as air quality, energy use and other environmental objectives. Whilst we welcome the serious attention which noise now commands as an environmental issue, the key challenge will be to integrate noise control policies into local sustainability plans. NSCA will be developing work on targets and indicators to guide this process. In the meantime we urge the Government to respond to our call to publish a formal noise strategy for the UK, so that all those with responsibility for noise control can begin to plan for a quieter future in a more co-ordinated way.

NSCA NEWS & VIEWS

Clean Air for Northern Ireland

The NSCA Council recently discussed the delays in implementing in the Province the pollution control legislation which applies in the rest of the United Kingdom and the consequent effects on air quality. Belfast, in particular, regularly records levels of air pollution worse than anywhere else in the UK. The Council adopted a Resolution which it has sent to Northern Ireland Secretary, Mo Mowlam, criticising the Government for failing to implement air pollution legislation. NSCA expressed the hope that the more encouraging security situation would enable attention to be given to environmental matters. In the Resolution, NSCA calls for

- a timetabled programme for aligning N. Ireland legislation and practice with that elsewhere in the UK and the European Union;
- regulations on the sale of unauthorised fuels;
- the IPPC Directive to be implemented in N. Ireland at the same time, and in a consistent manner, as in the rest of the UK;
- local authorities to be supported and encouraged to establish a framework for local air quality management in advance of full legal implementation of the legislation; and to secure for Belfast, through its designation as an Air Quality Management Area, the planning framework, resources and cooperation with neightbouring authorities to ameliorate the City's air quality problems.

A New Deal for Transport: Better for Everyone

NSCA has expressed concern over reports that no time is to be made available in the forthcoming Parliamentary session to introduce legislation implementing some of the proposals in the White Paper on the future of transport in the UK.

Meanwhile, NSCA has submitted comments on the White Paper to the Commons Environment, Transport and Regional Affairs Committee. In its evidence NSCA welcomed the general aims and aspirations of the White Paper, highlighting in particular:

- the better balance of economic and environmental factors in transport policy;
- the shift from the discredited "predict and provide" philosophy, which unduly favoured road transport, to more balanced, integrated consideration of transport options; and
- the recognition that transport policy has to reflect social concerns and the emphasis on access rather than on transport *per se*.

NSCA noted that the White Paper has its origins in the recognition that current transport policy is unsustainable. Congestion, poor air quality, and an under-funded and under-used public transport system have all become social, economic and political issues. The question, however, was whether the White Paper will do enough to deliver a sustainable transport system. On this basis, the NSCA has three fundamental concerns:

(i) The White Paper has avoided setting targets for its policies thereby shying away from clearly stating what it is trying to achieve. In addition, it does not say how its policies would contribute to the targets already in existence, e.g. the air quality standards in the National Air Quality Strategy or the CO_2 emission targets recently agreed for the EU. There is also concern about the lack of a clear monitoring procedure and some assessment of the cost effectiveness of the policies.

(ii) In order for any policy to achieve its stated aims there must be a clear delivery mechanism but the White Paper is notably short on these. In particular there is a paucity of measures at a national level and an unwillingness to adopt regulation when, for many aspects of road traffic and driver behaviour, this is the only effective approach.

(iii) The White Paper offers new powers to local government without offering, in addition, strong political support for what will be unpopular measures. There should be a clear indication of where the Government itself considers the new measures should be applied and an adequate indication of measures to back them up.

NSCA believes that the introduction of further options can help ensure effective delivery of the White Paper's objectives, set the national/local balance right and strengthen the hand of local authorities in implementing new local measures. These include:

- Stronger fiscal incentives for cleaner fuels. These should go in parallel with an investigation to find the optimum fuel mix for the UK fleet.
- Mandatory environmental performance standards for public transport, taxis and vehicle fleets. These should, at the very least, be built into the quality partnerships and quality contracts put forward in the White Paper.

- A strong enforcement regime and the provision of adequate funds for local authorities to enforce locally introduced measures, such as bus lanes and high occupancy vehicle lanes.
- The introduction of MOT emissions tests for vehicles less that three years old and a regulatory regime which encourages good vehicle inspection and maintenance rather than simply penalising emission exceedance.
- Strong support, and a legislative framework, for low emission zones.
- Stronger disincentives for larger vehicles and a realistic treatment of the company car perks package.
- Tax breaks for companies who introduce employee travel plans and financial support for schools who introduce school travel plans.

NSCA Local Environment Management Forum

Sustainable Development Strategies

Introduction

In its response to the consultation paper on a revised UK strategy for sustainable development, *Opportunities for Change*, the Local Environment Management Forum called for an obligation to be placed on all local authorities to produce a sustainable development strategy and annual sustainable development statements. The paper was submitted to the Government at the beginning of June and published in the July/August edition of *Clean Air* (Volume 28, Number 4); the revised strategy is due for publication towards the end of this year.

At the end of July, The Government published its White Paper on Local Government, *Modern Local Government in Touch with the People*. Chapter 8 of this document sets out the Government's plans to introduce a duty on local authorities to promote the economic, social and environmental well-being of their communities. It goes on to say that:

> "It will enshrine in law the role of the council as the elected leader of the community with a responsibility for the well-being and sustainable development of its area....[and will] put sustainable development at the heart of council decision making.
>
> The new duty....will include a requirement for councils to secure the development of a comprehensive strategy for promoting the well-being of their area."

The new duty proposed by the White Paper would appear, at first glance, to encapsulate all that was called for in the response to *Opportunities for Change* and as such it is to be warmly welcomed. The recognition that local government has a central role to play in the promotion of sustainable development and that, indeed, sustainable development must play a central role in local government activities, marks a major step forward.

However, the Government has yet to make explicit how this duty is to be introduced and how local authorities should integrate sustainable development into their operations and activities. There is an obvious opportunity, therefore, for the NSCA to attempt to influence this process and ensure that the very welcome sentiments expressed in the White Paper do not become watered down, overly bureaucratic or fall victim to the Government's already crowded legislative timetable.

Action by the NSCA

With these concerns in mind, the NSCA is seeking the following reassurances from the Government and will assess the Government's actions against them:

1. *Legislation* - There needs to be a commitment from the Government that the legislation required to introduce the duty will be carried in the next session of Parliament (1998/99). As a result of reports that there will be no Parliamentary time in the next session for any of the legislative measures announced in the Transport White Paper, there is a danger that the local government reform measures will also be squeezed out. If, as the White Paper states, the new duty will provide an overarching framework for local government, it is vital that it is introduced soon so that the foundations for further measures can be laid.

2. *Obligation* - The duty should be mandatory for all local authorities, county, district and unitary, and the Secretary of State should retain reserve powers to require recalcitrant authorities to undertake their obligations under the duty. Unless this mandatory status is granted, there is a danger that, in an era of highly competitive demands on local authority resources, it will fall victim to under-commitment and under-resourcing.

3. *Scale* - The legislation needs to make clear what each tier of local government is expected to achieve. There should be clear objectives set out in terms of national sustainable development and the Government should clarify to what extent each tier of local government, and each individual authority, can contribute to the achievement of those objectives.

4. *Integration* - The Government should be explicit in linking the new duty with the national strategy for sustainable development. There must also be a clear line on how sustainable development relates to and integrates with other policies and duties and any guidance produced by the Government must reflect this.

5. *Process* - The legislation should also lay down a clear process for the development of sustainable development strategies which should include their scope, the development process, the timescale over which they should be reviewed and the consultation process which must be undertaken. There are clear parallels with the recent legislation on local air quality management and the lessons learnt from the successful implementation of this legislation should be applied to the new duty.

6. *Guidance* - There needs to be a commitment from the Government to produce guidance for local authorities on the implementation of the new duty. One of the great successes of the recent legislation on local air quality management was the format which gave a framework, in legislation, for the duty, with the detail being provided in a series of guidance notes. This allowed far greater flexibility for both Government and local authority, while remaining explicit as to what was expected; this format should be repeated for the new duty.

7. *Emphasis* - The local strategy should be an over-arching document at the core of all of the authority's operations and all subsequent policies and activities should refer to it. The legislation must contain provisions which will ensure that this is the case and Government guidance will have a major role in the correct implementation of the legislation.

8. *Consultation* - The new duty should contain an obligation to consult widely on the formulation of the strategy. Moreover, the consultation process must be fully inclusive and allow active participation from all sections of the community, with a real opportunity for change. It should not be sufficient to say simply that consultation has been carried out - the form of, and results from, that process are equally as important.

9. *Resources* - As always, a new duty will require the commitment of resources, although there may be the possibility of re-assigning resources currently used for the development of strategies and policies which will come under the umbrella of the "well-being and sustainable development of the area". However, additional resources must be made available to local authorities by the Government in order that activities, such as consultation/participation, can be carried out effectively. Without effective consultation, the value of the entire process is significantly undermined.

While the obligations which the NSCA proposes are placed on local authorities may appear, in some ways, onerous, the intention is to produce a workable system for the integration of sustainable development into local government and all local government functions. The system consists of a duty placed upon local authorities to promote sustainable development in their area in conjunction with an obligation to produce a strategy which sets out how this duty is to be discharged. These points are to be enshrined in legislation along with the framework process for producing the strategy, the detail of the process being provided by guidance.

NSCA will be carefully studying the Government's final legislative proposals and if they do not meet our criteria, will advocate and promote relevant amendments during the passage of the Bill.

NATIONAL NOISE AWARENESS DAY 1999

Wednesday 7 July is the date of NAD 1999. This year NAD was a great success in promoting awareness of noise issues at local level; we hope to build on that success to stimulate more interest in noise issues at national level, with the support of the DETR and other interested organisations. NAD 1999 is currently at the planning stage and we are considering themes to provide a focus for the media. If you would like to support NAD and have any ides for events and activities, please contact Mary Stevens at NSCA, Email: info@nsca.org.uk

AIR QUALITY

Local Air Quality Management
Some Evidence of Current Practices

Clare Beattie, Alex Newton and Professor Jim Longhurst
Air Quality Research Group
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The recent legislative changes, notably the Environment Act 1995[1] and resultant National Air Quality Strategy[2], have brought new powers and obligations to local authorities to reach specified air quality standards and objectives. Initially this will involve local authorities carrying out a review and assessment of air quality in their locality by December 1999. This paper will outline a project currently being undertaken within the University of the West of England investigating how this legislation is being put into practice and present the results from a nation-wide questionnaire survey of environmental health officers. The study found that local authorities are still at an early stage of the process. It seems probable that one possible barrier to the implementation of Air Quality Management will be communication and cooperation within local authorities.

1. Introduction

Local authorities are currently undertaking, or about to embark on the Government's air quality *review and assessment* process as outlined in the National Air Quality Strategy and subsequent guidance notes[2,3,4]. There is likely to be a large disparity of progress, not least because of the designation of certain local authorities (and groups of authorities) as *first phase* authorities, intended to act as guinea pigs testing different aspects of the Air Quality Management (AQM) process. The project currently being undertaken by the authors investigates how urban AQM is progressing in the context of the new legislation. The project will attempt to answer questions such as:

- What is the current range of local authority AQM activity and practice?
- What tools, if any, are being used to monitor current air quality and predict future scenarios?
- What levels of integration are occurring between local authority departments such as transportation planning, economic development and land-use planning?
- What levels of cooperation are occurring between adjacent local authorities?
- How is air quality information being disseminated to the public?
- What policy measures are already in place, or planned, to improve air quality?
- What are perceived as the main obstacles to the AQM process?

This paper summarises the results from a questionnaire survey of environmental health officers undertaken in spring 1998. The project is currently surveying planning officers, economic development officers and transportation officers of district authorities, planning and transportation departments of county authorities as well as health authorities, the Environment Agency and consultants working in the AQM field. An analysis of these results will be available over the coming months. The authors will then investigate the levels of integration within and between district and county authorities, health authorities and other participants involved in AQM. It is believed that cooperation between these different participants is central to the AQM process as a whole.

2. Current Practice – Evidence from a Questionnaire Survey

A questionnaire was sent to 141 environmental health departments within local authorities in England identified by the authors as urban. The questionnaire comprised a majority of closed questions, but included some open questions to obtain the greatest detail possible, whilst ensuring the maximum response rate. Preliminary analysis of the returned questionnaires (representing a 56% response rate), manifested the following results. It should be noted that these results form part of a much larger study and represent the position of local authorities in spring 1998.

At present, of the 79 authorities who returned questionnaires, all except one were doing some form of air pollution monitoring, although this varied from authorities such as Broxbourne which only has six nitrogen dioxide diffusion tubes, to authorities such as Bristol which has a comprehensive monitoring strategy for all the pollutants for which air quality objectives must be met. Sixty per cent of

Table 1: percentage of local authority respondents currently monitoring the listed pollutants and the numbers intending to increase their monitoring networks in the next 12 months

	Currently monitoring		Increase network in next 12 months	
	Real-time	Passive	Real-time	Passive
	%	%	%	%
Benzene	7	37	1	9
Nitrogen dioxide	53	85	43	13
1,3 butadiene	4	7	1	4
Carbon monoxide	37	0	12	0
PM_{10}	44	7	43	3
$PM_{2.5}$	4	1	7	0
Lead	1	15	3	1
Sulphur dioxide	44	29	29	4
Ozone	47	8	6	4

Table 2: percentage of respondent local authorities currently using the models named and percentages intending to use them in the next 12 months

	Currently being used	Intending to use in next 12 months
	%	%
Aeolius	5	5
Airviro (INDIC)	14	12
ADMS-Urban	21	33
CAR International	5	4
CALINE4	8	4
DMRB	17	14
US EPA models (eg ISC)	5	0

authorities were planning to expand their networks in the next 12 months.

Far fewer authorities were currently undertaking any modelling, or knew their intentions for the next 12 months. Forty-two per cent of responding authorities had used some sort of dispersion or screening model. This is an expanding area with 54% of respondents intending to undertake some modelling activity in the next 12 months, 51% of these for the first time.

The only other models used by a local authority are Transport Panache (1 authority), GRAM (1 authority, although 2 intend to use it in the next 12 months), R91 (2 authorities) and AA Qiure (1 authority).

Of those authorities that had used models, 48% had used a local authority employee and 63% had employed a specialist to undertake the work.

When asked whether there was a group within their local authority to address air pollution issues, 65% said yes, whereas 34% did not have any such group (1% were unsure). Of those with a pollution group, 87% thought that the proportion of the group's time devoted to air pollution issues would increase. Thirteen per cent thought there would be no significant change, while none thought there would be a decrease in time allocated to air pollution issues.

Although 96% of these groups had environmental health as the lead department (and all but one contained environmental health officers), there were a number of other departments involved. Seventy-five per cent of groups involved town planning officers, 25% included economic development officers, 75% contained highways engineers and 35% included Agenda 21 officers. However, only 15% included elected members and just 8% involved chief executives.

A far higher proportion of authorities (97%) were involved in regional groups. Although environmental health officers again predominated, many other local authority departments and outside organisations are involved, for example the Environment Agency, higher education institutions, health authorities, community groups, pressure groups and business/industry representatives.

For the dissemination of information, again there was a large disparity between authorities, with many commenting that they are only just beginning to address the issue of how they will disseminate air quality information. For example, one district authority stated that it was waiting for data to be readily on-stream before establishing methods of disseminating information to the public.

Other methods used to disseminate information included a free-phone helpline (4 authorities), committee/council reports (2 authorities) and one council advertised air quality in its own newspaper.

Likewise, policy measures currently in place were also surveyed.

Table 3: percentage of local authorities which are using the following methods to disseminate information

	%
Air Quality Report	61
Council Internet site	21
TV/ radio bulletins	29
Variable message signs (roads/buildings)	14
Paper-based displays in public areas	25
Local newspapers	36
Local pages of Teletext/Ceefax	18
As part of sustainability update/Agenda 21 report	28
Computer terminals in public buildings	12
Public information leaflets	34

Other policy measures included use of electric cars by one council, a smoky exhaust notification system, participation in the 'Don't Choke Britain' campaign and the Westminster Green Pennant scheme (a vehicle sticker which identifies a low emission vehicle and allows priority access to certain areas over more polluting vehicles).

It is quite probable that many of these policy measures will increase in implementation. Several authorities commented that they are just beginning to execute the above policies, and with the recent publication of the Integrated Transport White Paper, authorities will now reconsider their position in respect of many of the above measures.

3. Time-Scale of the AQM Process

The time period over which the AQM process must operate is, by necessity, long term. Following policy changes, the changes in behaviour and attitude required for this legislation to be successful, will take time. In urban areas, where transport is a significant contributor to air pollutants, people will need to change their travelling habits. A high proportion of local authorities have policies to encourage cycling, walking and public transport for shorter journeys, discouraging car use through fiscal measures and setting up education strategies (see Table 4). The effectiveness of these policies remains unclear, particularly in the time-scales necessary for implementation.

Table 4: percentage of local authorities with the following policies already in place to improve air quality

	%
Making car use more expensive or less convenient for short journeys	27
Smoothing traffic flow	39
Encouraging public transport	80
Encouraging cycling	84
Encouraging walking	63
Increasing awareness of the implications of transport policies and choices	42
A commitment to link air quality with Transport Policies and Programmes	65
Linking air quality issues into structure and local plan process	56
Green commuter plans	33
Bus operator/business partnerships	35
Campaigns to encourage better maintenance of cars	48

New technologies, such as cleaner fuels, will also play a role in reducing emissions. It will take time for the technologies to be tested, as well as for car manufacturers to implement changes and for these changes to filter through to the market place.

From the survey, it is clear that local authorities are still at an early stage in the whole process. When asked "at what stage is your local authority currently in the Government's *review and assessment* process for Air Quality Management?", 10% had not yet started, 73% were still at the first stage with just 12% having progressed onto the second stage and 5% onto the third stage. When asked what stage of the process they envisaged reaching, 63% thought they would have to go onto a third stage, 27% envisaged reaching a second stage with only 4% thinking that a first stage *review and assessment* would be sufficient. Six per cent were unsure.

4. Role of Professions other than Environmental Health

From the above early assessment of how AQM is being implemented in the UK, it is clear that the environmental health profession currently dominates the process. It is absolutely vital for the success of AQM that other professions (particularly planners, economic development departments and highways engineers) become involved. Air quality implications must be considered at the outset of any planning processes, for example with regard to planning applications, highway policies, other strategic plans including car parking policies and industrial development policies. As changes in planning policy are likely to take some years before an impact on air quality is apparent, the issue of involving different professions must be addressed as soon as possible.

An integrated approach between the different professions involved is essential. It is fundamental that these various players communicate and cooperate *within* and *between* their local authorities and with other outside bodies such as the Environment Agency. As has been illustrated by the survey, communications within local authorities is often lacking. This issue will be investigated in more depth as the project currently being undertaken by the authors continues to survey planning, economic development and highways departments within local authorities (both at district and county level) and medical officers liaising between health authorities and local authorities.

5. Discussion

From this overview of AQM practice in the UK, it can be concluded that most local authorities are still at a very early stage of the process. It is significant that from the data presented in Table 1, the most monitoring is of the three pollutants generally recognised as most likely to breach the objectives set out by the UK National Air Quality Strategy (i.e. nitrogen dioxide, PM_{10} and sulphur dioxide). These are also the three pollutants that are most likely to have increased monitoring activity within the next 12 months. There are a significant number of local authorities intending to increase their monitoring network within the next 12 months, also indicating that many authorities are only just embarking on the AQM process.

One of the early indications of a possible barrier to the implementation of AQM in the UK is integration between different departments within local authorities[5]. Communication and cooperation seems to be the significant factor, and a potential hindrance, in the AQM process. Evidence suggests a greater degree of integration between adjacent local authorities (particularly through regional pollution groups) than groups within local authorities. This has also been demonstrated by a study looking at local authorities within the South West[6]. This is now seen as one of the major challenges faced by local authorities in reaching the objectives set out in national legislation.

From evidence outlined in this paper, one of the other areas most lacking within the AQM process is the dissemination of information and education. For AQM to be successful, two forms of air quality information must be publicised. Awareness of transport choices and their implications in particular will have long term ramifications for air quality especially within an urban area. In addition, real-time air quality information and forecasts will be necessary for avoiding short-term air pollution episodes. Methods such as variable message signs on roads, or informing doctors' surgeries and hospitals on days of poor air quality will need to become more wide-spread before a decrease in air pollution episodes is apparent. The need to rigorously test the effectiveness and efficiency of these policies and measures is paramount to a successful AQM strategy.

The project will proceed in examining the integration of all the professions involved in the AQM process, as well as looking at changes in policy measures, dissemination of information and perceptions of how the process is advancing and what the major obstacles are to the improvement of air quality. Questionnaire surveys have been sent to planners, highways officers, economic development officers and medical officers (health authorities) in order to assess the integration between these departments (as well as between authorities) as the AQM process evolves. The project will also attempt to investigate the development of the process as it moves from the domain of environmental health departments (as illustrated by this paper) to planning, highways and economic development departments, which will be vital in providing long term solutions to poor air quality.

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Investigation of Air Pollution at a Polluted Road Junction

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Introduction

Part IV of the *Environment Act 1995*, requires local authorities to a undertake a structured review and assessment of air quality within their own geographical area. Carbon monoxide is one of the seven air pollutants which needs consideration. The DETR guidance[1] advises that, for the purposes of the review and assessment local authorities should have regard to locations where individuals are likely to be exposed over the period of the averaging time of the prescribed air quality objective. However the exposure of the population to gaseous pollutants emitted from vehicles is highly complex due to the variation of emissions under changing driving conditions and the effect that this has on pollution concentrations locally. The above DETR guidance advises for the purposes of a first stage review and assessment for carbon monoxide (CO) that the following should be identified:

- road links with current or projected average daily traffic flow > 50,000;
- road segments with current or projected average daily traffic flow > 25,000 and where traffic travels at mean speeds < 10 $kmhr^{-1}$ for prolonged periods;
- a combination of road transport and low level combustion sources > 2,000 tonnes in a 1 km x 1 km area in 2005.

The CO monitoring at the AUN/London Air Quality Network's Bromley 4 kerbside site on Tweedy Road has consistently shown some of the highest recorded concentrations in London (with 97 exceedences of 8-hour rolling average carbon monoxide compared with 4 at Ealing, the next highest site during 1996)[2]. Figure 1 shows the road network and site. In the light of the review and assessment process and the monitoring results at this site the LB of Bromley and the SEIPH agreed to investigate what effect the traffic flow, particularly in relation to the nearby traffic light controlled junction, has upon the build up of CO concentrations at this location.

In London, petrol motor vehicles are the dominant source of CO emissions, contributing 95% of the total CO emissions[3]. CO is created by the incomplete combustion of fuels, with varying driving conditions and speed being important variables. Figure 2 illustrates the influence of average speed on the typical variation in CO emission rates for a non-catalyst petrol engine car. CO emissions from standard petrol cars under optimum conditions generally exceed those fitted with a three way catalyst (TWC) by more than 10 times (27 gkm^{-1} and 2 gkm^{-1} respectively) and diesel engines by 30 times. However this situation does not hold true when cold starts are taken into account, since the TWC can take up to 2-3 km to reach its optimum operating efficiency. During this period, when the motor vehicle is started from cold, CO emissions are particularly high, especially within the first 1 km of a journey (TWCs emit 8 times more CO in the first kilometre than at the end of a 10 km journey). Cold start emissions have been estimated to contribute approximately one third of the total CO emissions. Taking into consideration that 40% of all UK journeys are less than 5 km, this remains an important factor when considering overall CO emissions.

An important conclusion of the research undertaken jointly in France (INRETS, CEDIA), Germany (TUV Rheinland) and UK (TRRL) was that the estimation of emissions from vehicles which have the same average speed, but which undergo different driving cycles (i.e. with different acceleration and deceleration phases), give significantly different results, particularly in relation to CO and hydrocarbons. Matzoros and van Vliet (1991)[4] suggested that excess CO emissions at a signalised junction (i.e. those emissions calculated for traffic controlled by a junction, minus those that would have been produced had the same number of vehicles passed unhindered through the junction) for under capacity flow, e.g. traffic flow of 900 veh/h with a possible capacity of 1000 veh/h, would see the acceleration phase account for 47% of the excess whereas queueing would take up 38%. However, in an overcapacity flow scenario (e.g. 1100 veh/h) CO emissions are not only greater by 7 times (0.67 gs^{-1} to 5.18 gs^{-1}) but the queueing phase dominates with 56% of the excess emissions with acceleration decreased to 34%.

This is relevant to road traffic junctions where cars alternate between constant speed, deceleration, idling and acceleration, throughout the day according to the traffic light sequence. Furthermore, this conclusion is borne out by the measured data at the Bromley site which has consistently recorded some of the highest levels of CO in London. Such junctions are not exceptional and so an understanding of how driving phases affect emissions from vehicles is important. In addition this would benefit the understanding of how best to represent road traffic with computer models and thus aid a more robust assessment of future air quality.

Method

The CO concentration was measured using a Thermo Environmental Instruments Inc. Model 48 Gas Filter Correlation (GFC) Ambient CO Analyser. This analyses

the infrared absorption spectrum of the sampled gas and has minimum detectable levels of 0.1 ppm with a precision to ±0.1 ppm and rise/fall times for responses from 0-95% (at 1 lpm flow, 30 seconds response time) of 1 minute. The latter was important in estimating a lag period, (of approximately 1 minute 30 seconds from taking a sample to recording at least 95% of the true concentration) when correlating analyser output to traffic flow conditions. Samples from the analyser were recorded at 12 second intervals and averaged over 15 minute periods. The resulting data were validated to allow for zero and span drift, with a scaling factor applied.

In addition a chart recorder was connected to the CO analyser to provide a more detailed trace of the instruments response to ambient levels. This provided five readings every minute. Data from the chart recorder were also scaled to account for zero and span drift.

A video camera was set up on the opposite side of the road to continuously record timed traffic movements at the junction. This enabled the estimation of speed and acceleration/deceleration values.

Details of the sequencing of the traffic lights on the junction was provided by the LB Bromley Traffic Engineering Department. The averaged daily weekday traffic profile taken from the summer 1997 counted data is presented in Figure 3. This shows the morning and early evening rush hour spikes for both directions as well as a significant stream of traffic throughout the inter peak period.

A sonic anemometer was also used to provide a localised assessment of wind speed, wind direction and temperature averaged over half an hour periods. Additional remote weather conditions were obtained from the London Weather Centre to indicate the prevailing conditions.

Results

The study was undertaken on Wednesday 15 October 1997 between the period of 08:00 and 18:00 hours. The weather throughout the day remained overcast, with occasional drizzle occurring in the morning and late afternoon. Winds were slight and northerly and the temperature remained at a stable 12-13 C throughout the study day. Data from the sonic anemometer also showed very light winds travelling down Tweedy Road towards the junction, confirming that there was no canyon effect to bias the results. The London Weather Centre data showed the dominance of northerly winds at 2.1 ms^{-1} prevailing in the capital. Subsequent examination showed the weather on the study day to be typical of approximately 5% of the year, although both the day before and the day after had different dispersion conditions.

The monitored 15 minute averaged values (Figure 4) were aggregated into hourly CO values (Figure 5 shows the fluctuating pollution levels for the day before, study day and day after for the Bromley site and for comparison four other LAQN sites (two roadside and two urban background)). Figure 6 shows the 8-hour rolling average concentration over the same three day period.

The traffic flow was assessed using the freeze frame video to calculate the 12 second conditions that related to the chart recording output. It was considered appropriate to utilise the category system for traffic conditions suggested by Matzoros and van Vliet[4] for data comparison, which defines the four phases of traffic flow as: acceleration, cruise, deceleration and queueing. Three half hour periods of the day were used for comparison, to analyse peak morning and late afternoon conditions with a quiet mid afternoon period. Figures 7, 8, and 9 show the measured and calculated results for these three periods.

Discussion

The carbon monoxide concentration remained at elevated levels with the 15 minute averages never dropping below 4.5 ppm during the study period, averaging 8.6 ppm and with a maximum of 15.3 ppm. The 1 hour averaged concentrations for the study period ranged between 6.0 to 13.7 ppm, which is considerably below 25 ppm where blood carboxyhaemoglobin levels would reach 2.5% during maximum human physical activity[5]. A comparison of the hourly three day analysis of the Bromley 4 site with four other networked sites shown in Figure 8, highlights specific variations in CO concentrations. The urban background sites indicated steady levels throughout each day (although the Kensington and Chelsea site appears to reflect early morning conditions). The two roadside sites, located at a distance of 5 metres from the very busy roads, rather than the 1 metre for a kerbside location, reflected a similar profile to Bromley 4. The significant evening peak however was not mirrored, suggesting a probable localised event. The 15 October data also showed elevated concentrations of CO at all three roadside/kerbside sites, reflecting perhaps the prevailing weather conditions throughout London.

The 8-hour rolling mean standard of 10 ppm[6] was almost exceeded, attaining a maximum level of 9.2 ppm. Figure 9 highlighted the study period as a day with higher CO concentrations compared to the day before and after (maximum 8-hour values of 3.2 ppm and 3.9 ppm respectively); this may in part be explained by increased dispersion due to the slightly stronger winds on the other days.

The southbound traffic flow for Tweedy Road indicated average weekday flows of approximately 19,000 vehicles per day, with consistent flow rates of over 1,000 vehicles per hour during the hours of 08:00 to 19:00. The two daily peaks at 08:00 and 17:00 hours (see Figure 3) had average flows of 1273 and 1392 veh/h, however these do not significantly dominate the daily traffic flow profile as is the case for many other roads. The estimated average recorded traffic speeds, indicated cruise speeds of approximately

9.25 ms^{-1} (33 kmh^{-1}) with a maximum noted at 12.3 ms^{-1} (44 kmh^{-1}). Decelerating speeds were calculated at 5.1 ms^{-1} (18 kmh^{-1}).

The analog trace line output from the CO analyser onto the chart recorder revealed a distinctive cyclical response to ambient air quality conditions, highlighting peak to peak time periods of approximately 1 to 2 minutes (based on the 12 second recording intervals). However, during periods of high CO concentrations this cycle often extended over two inter peak periods. As indicated previously the response time of the analyser to the instantaneous ambient air conditions was important when correlating traffic conditions with air pollution. The measured response time of approximately 1 minute 30 seconds corresponded with the analyser's specifications. Consequently the recorded air pollution was adjusted back by this time period to relate it to the existing traffic conditions when the air sample was taken.

Figures 7, 8 and 9 show the profiles of measured CO (adjusted back to take account of the response time) together with the traffic flow category for three varying half hour periods during the study day. The first incorporates the peak morning traffic and the subsequent tail off after 09:00, whereas the second covers a quiet mid afternoon period. The final profile encompasses the early evening peak traffic flow conditions.

A correlation analysis was carried out to investigate the apparent link between the individual cycles of CO and the traffic cycles with the peak measured CO generally equating to periods of queueing traffic (although it should be borne in mind that the traffic flow category is an inferred value). The closer the relationship value (multiple r), is to 1, the stronger the relationship. Significance level tables show that values greater than 0.254 indicate a 99% chance of a statistically significant relationship with 100 or more paired samples. The multiple r correlations calculated, were as follows:

- morning = 0.16;
- afternoon = 0.54;
- evening = 0.42.

The values show that afternoon and evening periods have a significant relationship. However this was less apparent for the morning period, where initial concentration troughs coincided with queueing traffic. Further analysis of the data showed this only at the beginning of the profile, with the previously observed trend throughout most of the 30 minute period.

The study demonstrates that CO pollution from traffic in close proximity to a traffic light controlled junction vary considerably over a relatively short period, with a cyclical relationship lasting one and a half minutes for each cycle with the traffic lights signal sequence. This relationship confirmed that queueing traffic gave rise to the peak CO levels. This situation was apparent even during periods of relatively low traffic flow.

Conclusion

This short study, which covered a ten hour period has provided a valuable insight into the real world problems of predicting localised pollution from traffic emissions. The project identified a direct link between the motor vehicle driving phase with related cyclical short term CO concentrations, suggesting that interruption to the overall traffic flow has a deleterious effect on air pollution. Indeed the variable extent of queueing time and capacity flow volumes significantly adds to the general profile.

Suggested improvements to the method include recording the traffic build up at the junction, together with traffic flow passing a set point (the monitoring site), as these would assist understanding. The study also coincided with a day showing relatively high carbon monoxide concentrations, it may therefore prove worthwhile to research short term cyclical concentrations with those from a day showing lower measured hourly values. This would help to indicate whether the general concentration levels are reduced with similar high peak concentrations or the concentrations as a whole are significantly capped.

The findings of the study highlight that the review and assessment of air pollution on a local scale, together with the prediction of the future likelihood of exceedences of the National Air Quality Standards for carbon monoxide, requires the consideration of specific factors of traffic flow conditions. The findings demonstrate that:

1. The highest rates of emissions come from slow moving, congested traffic;
2. Stop-start driving causes higher emissions i.e. accelerating, decelerating and idling which typifies urban driving patterns;
3. Poorly tuned vehicles can emit substantially more pollution than those serviced effectively;
4. There is a marked effect due to ambient temperature, with cold engines working less efficiently and the potential for catalysts not being at full operating temperature.

The evaluation and quantification of these is very difficult in a real time study, particularly when environmental factors are taken into the overall scheme, as specific weather regimes will either exacerbate or lessen the air pollution. The study has confirmed that the interruption of significant traffic flows has a greater influence on air pollution at a very localised level than traffic volumes alone, and therefore sites with queueing traffic need to be considered in the review and assessment process. However, it must be borne in mind that traffic and environmental conditions are always site specific and interpretation to similar locations must be approached with caution.

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3. London Research Centre (1998). London Atmospheric Emissions Inventory, LRC London.
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5. Expert Panel on Air Quality Standards (1994). Carbon Monoxide, HMSO, London.
6. Department of the Environment (1997). The United Kingdom National Air Quality Strategy.

Acknowledgement

The authors are very grateful for the help and assistance of the LB Bromley in undertaking this study. The views expressed are the authors only and not necessarily the LB of Bromley.

Figure 1

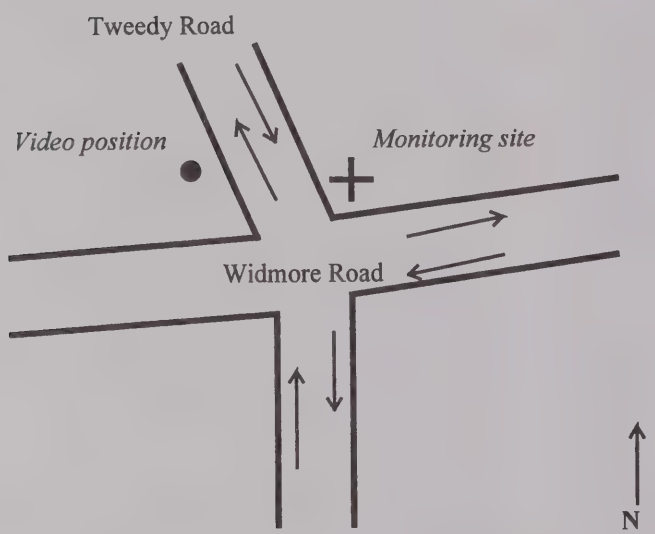


Figure 2: Speed related carbon monoxide emission factors for non-catalyst petrol engine cars at 1995 base year levels *(source: DMRB, 1994)*

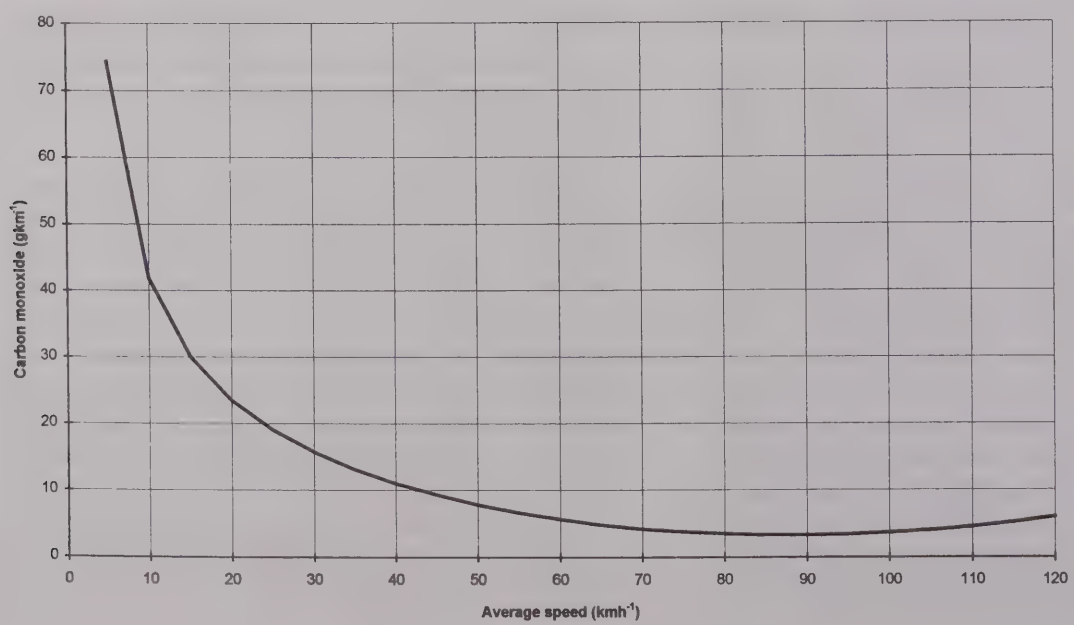


Figure 3: Daily traffic profile at Tweedy Road, Bromley

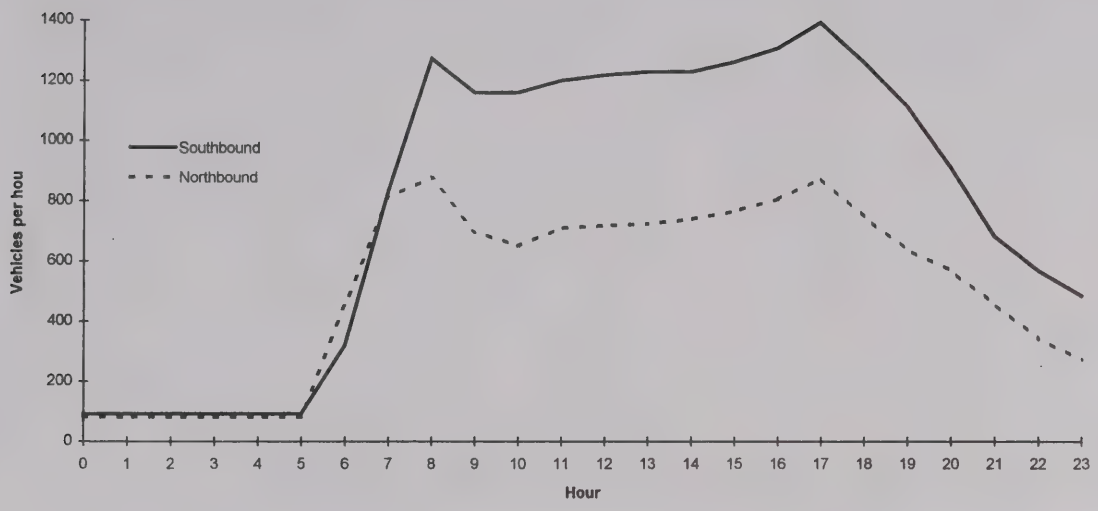


Figure 4: Scaled 15 minute average carbon monoxide concentrations at Bromley 4 on 15 October 1997

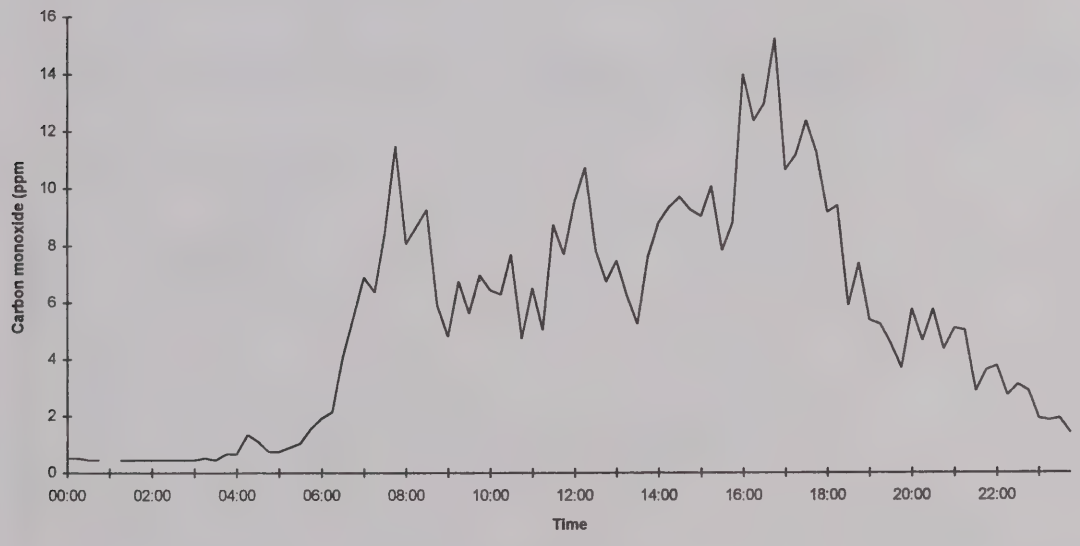


Figure 5: Carbon monoxide hourly averages at Bromley 4 and four other London sites from 14-16 October

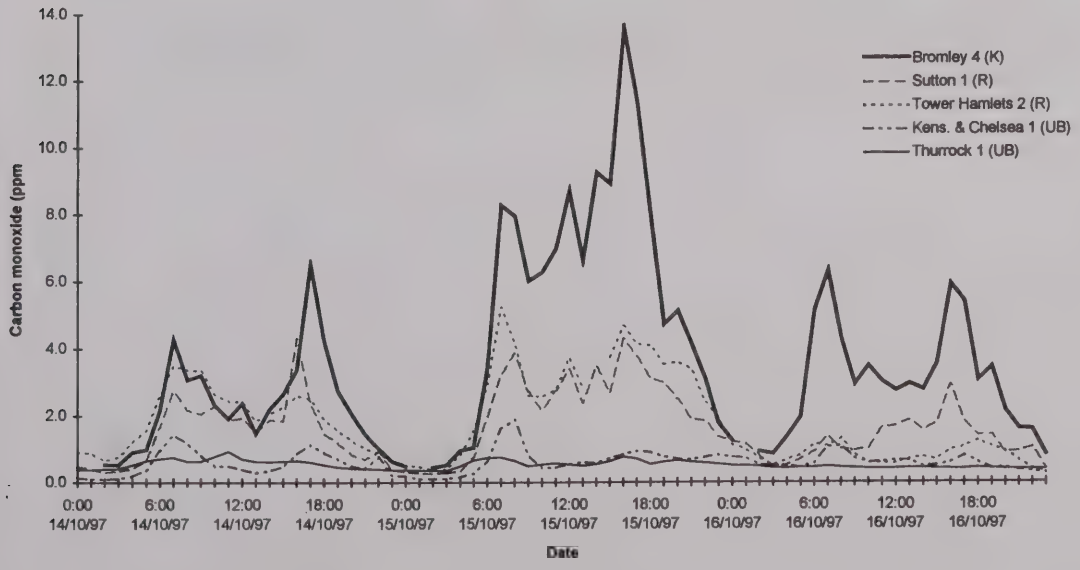


Figure 6: Carbon monoxide 8-hour rolling average at Bromley 4 from 14-16 October 1997

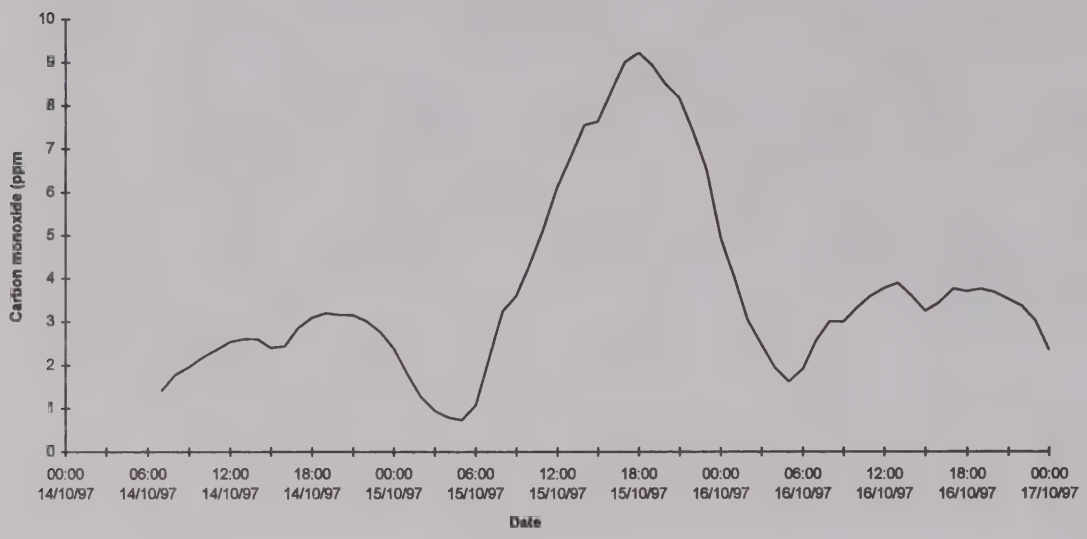


Figure 7: Carbon monoxide concentrations in relation to traffic flow category

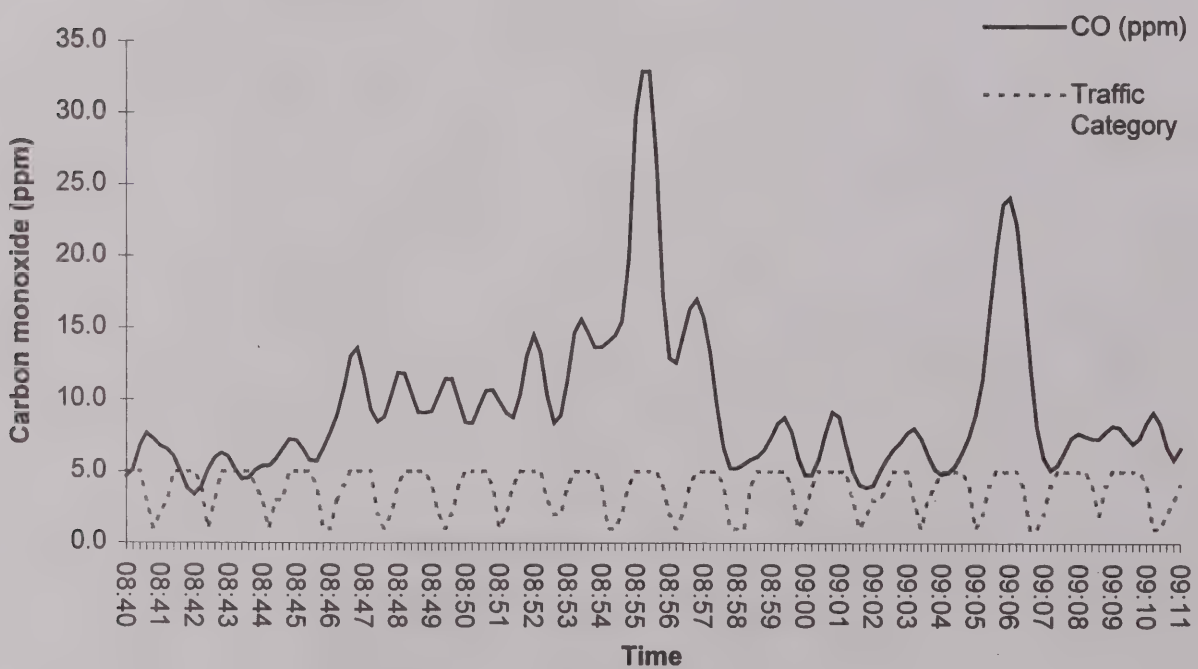


Figure 8: Carbon monoxide concentrations in relation to traffic flow category

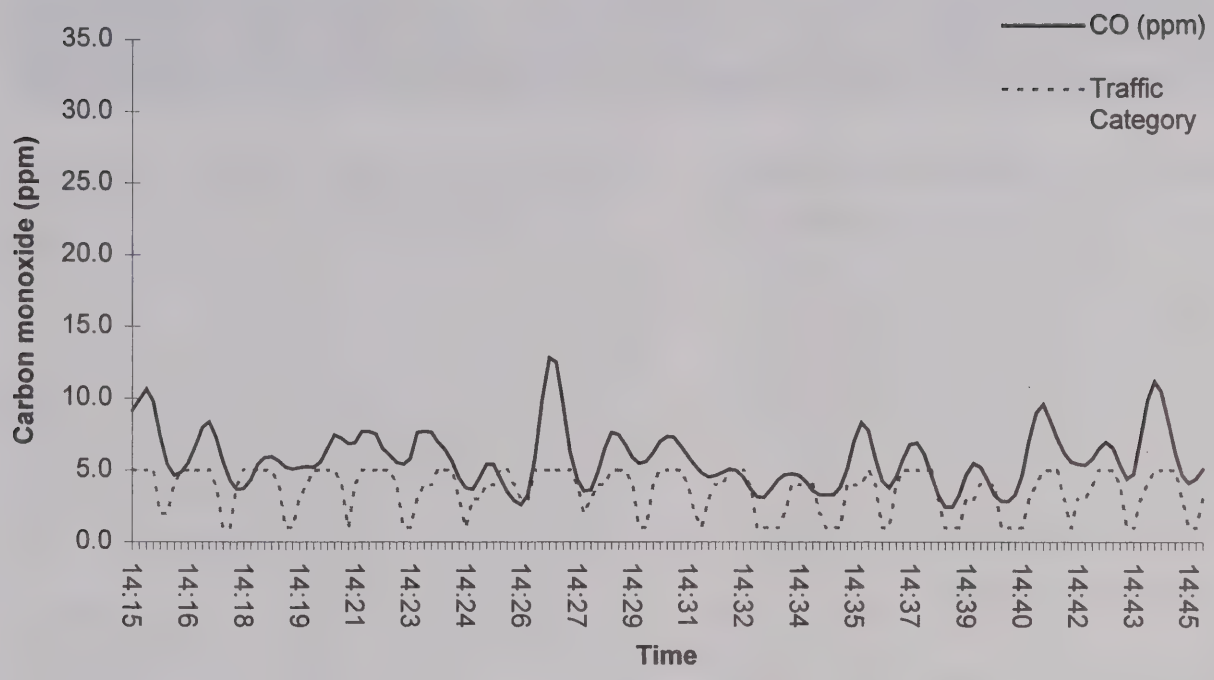
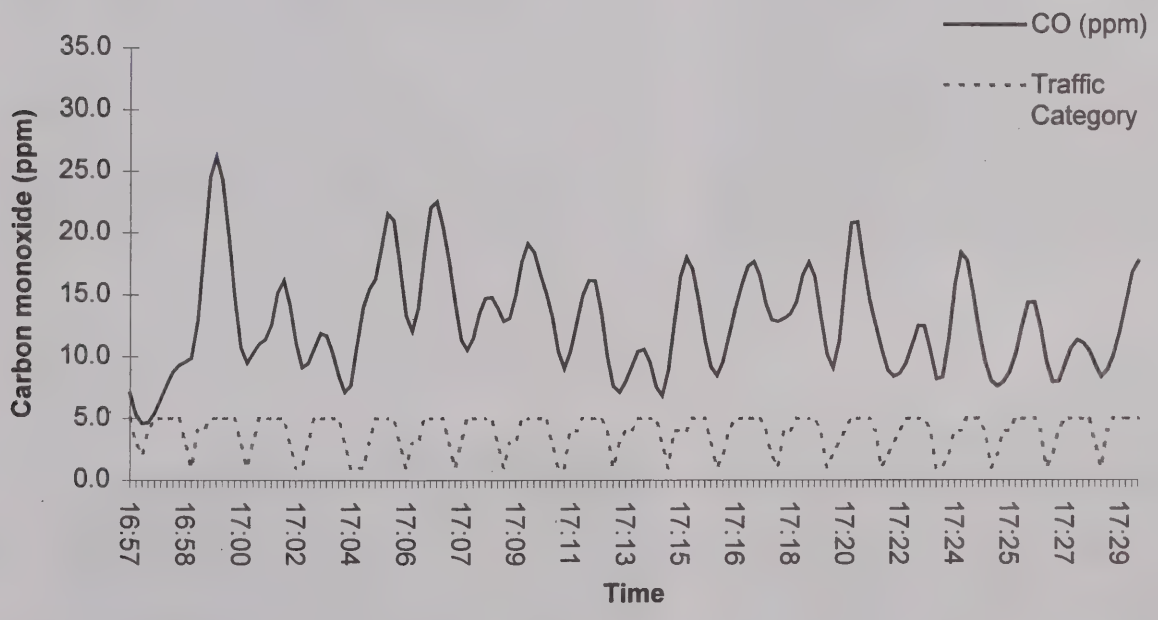


Figure 9: Carbon monoxide concentrations in relation to traffic flow category



UPDATE

WHO Conference on Environment and Health

The Third Ministerial Conference on Environment and Health is to be held in London next June and is expected to attract up to 400 delegates, from 51 countries. The theme of the conference and accompanying exhibition is "the implementation of actions in partnership", and it will aim to set the agenda for environment and health for the early years of the 21st century. Six specific areas of interest are to be covered:

- Prevention, reduction and control of water-based diseases;
- Transport and environmental health;
- Guidance on implementing national environment and health action plans;
- Involving the public and non-governmental organisations;
- Good environmental health practice in industry;
- Environmental health economics.

Environmental Management

A recent survey sponsored by the British Standards Institution reveals that while many business leaders understand the role of environmental management systems (EMS) in reducing environmental risks and increasing compliance with environmental legislation, few are aware of the rapid growth in this legislation emanating from the EU.

The research also showed that while about two-thirds of businesses had some form of EMS, only one-third had external auditors verify its effectiveness, and only 15% had any form of recognised EMS certification. Most had established an EMS because their customers required it, a past incident held them liable for environmental damage, or they wanted to build brand value. Over half the businesses surveyed expected the importance of environmental issues to grow dramatically in the next few years.

EA and Police Cooperation

The Environment Agency and the Association of Chief Police Officers have signed a Memorandum of Understanding which sets out how they will work together to protect the environment. The aim is to ensure effective cooperation between the Agency and police during incidents in which the environment is at risk of harm.

The Memorandum covers communication arrangements between the two organisations as well as effective liaison procedures at major environmental incidents in which the police are involved. It also covers contact procedures, training initiatives and dealing with environmental crime.

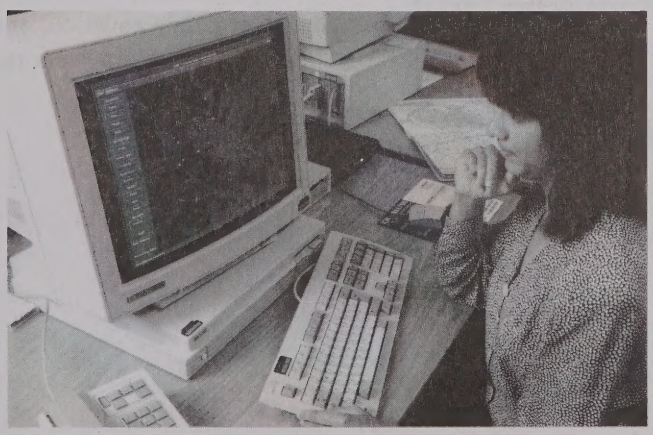
MEMBERS NEWS

Members! Are we covering your news? Please check that your press office has *Clean Air* on its mailing list.

Shell UK has announced plans to develop a network of 200 LPG fuelling sites on its forecourts throughout the UK, using the new brand name MotorGas. The aim is to have LPG available to 80% of motorists by the year 2001. Fifty sites have already been identified, but Shell is asking for input from local authorities and fleet operators before deciding on further locations.

ICI has discovered a novel use for old banknotes - turning them into waterproof composite building board. Thanks to their high moisture resistance, the notes can be mixed with rigid foam waste to produce a board that can be used in showers and swimming pools. Used notes from China and Poland are currently being recycled, but ICI is looking forward to the introduction of the EU single currency, which should guarantee a large supply of redundant banknotes.

Stanger Science & Environment has been contracted by DETR to provide a helpline for local authorities on dispersion modelling and stack height calculations for industrial processes. It builds on the advice service which SSE operate on dispersion models for local air quality management. Dr Yasmin Vawda (below) is in charge of the new helpline, which can be contacted on 0181 256 4972, or by email at modelhelp@stanger.co.uk



Yasmin Vawda, Senior Consultant with Stanger Science & Environment

LB Southwark is the latest local authority to sign up to the Alternative Traffic in Towns Initiative (ALTER), as John Prescott recently unveiled the Borough's new fleet of electric and gas-powered vehicles. The project aims to get several hundred European cities to agree to introduce low or zero-emission vehicles to their fleets. Other NSCA members participating include **Camden, Westminster, Bradford, Bridgend, Bristol, Cardiff, Coventry, Leeds, Newcastle, Nottingham** and **Oxford.**

Over 150 of NSCA's member local authorities took part in Noise Awareness Day this year. The prize for the most dramatic awareness stunt must go to **Cardiff County Council**, who disposed of a pile of confiscated hi-fi equipment by running a landfill compactor over it, as our photos show. Rob West from Cardiff assures us that the equipment was of poor quality - all the good stuff was recycled to worthy causes!

Before ...

... and After

For the second year running **Winchester City Council** has bucked the national trend by recording a decrease in noise complaints. A concerted information and awareness campaign, including displays and radio phone-ins, has resulted in a drop of 40% in complaints.

NSCA member **Dr Mark Broomfield** has joined Aspinwall & Co as a Senior Environmental Consultant. Mark will be working on air quality management,

dispersion modelling and risk assessment.

Nottingham City Council has launched a new partnership to study energy use in the city and identify ways of reducing energy costs and improving the environment. The Nottingham Energy Partnership has the active support of NSCA Past President **Lord Ezra.**

An extremely well-attended seminar on alternative fuels was organised in September by **Westminster CC**. NSCA Vice-President Steven Norris chaired the day, and Cllr Catherine Longworth of Westminster gave the keynote speech. Our photo shows Steven and Cllr Longworth with a LNG-powered tractor unit operated by BOC Distribution Services.

Steven Norris & Cllr Catherine Longworth

Over the next few months **Sainsbury's** will be offering free car emission checks to customers at 17 supermarket sites. Transport Minister Dr John Reid officially launched the Government's Greener Vehicle Campaign at the Sainsbury store in Vauxhall, London.

London Transport's latest environmental performance report shows that 70% of London buses are now using ultra-low sulphur diesel, 40,000 indigenous trees have been planted on underground embankments, and new tube trains are 20% more energy efficient. LT is also planning to close its two ageing gas-fired power stations and use electricity from the National Grid instead.


l-r Maurice Jones, Eric Raven, Mary Newlands, Bill Dunn

Divisional News

The East Midlands Division AGM saw retiring Chairman David Romaine hand over to Dr Mary Newlands of South Derbyshire Health Authority. Alan Brown, Ken Williams, Nigel Tranmer and John Milnes were confirmed as members of the NSCA National Council. Former Divisional Secretary Eric Raven presented Maurice Jones and Bill Dunn with Certificates of Commendation, and engraved crystal tankards, on their retirement from the Divisional Council.

FORTHCOMING NSCA EVENTS

Tuesday 10 November 1998
Training Seminar - NEC Birmingham
Greenfield or Brownfield?
Environmental Implications of New Development

Thursday 16 November 1998
Workshop - London
UK Dispersion Model Users Group

Thursday 10 December 1998
Royal Society of Arts, London
NSCA Centenary Conference - Forward Vision

Thursday 10 December 1998
Banqueting House, London
NSCA Centenary Reception

Tuesday 16 February 1999
Training Seminar - NEC Birmingham

Thursday 18 and Friday 19 March 1999
Spring Workshop - Abingdon

Thursday 24 June 1999
Training Seminar - NEC Birmingham

Monday 25 - Thursday 28 October 1999
Annual Conference and Exhibition - Brighton
Environmental Protection 99

Tuesday 2 November 1999
Training Seminar - NEC Birmingham

Tuesday 15 February 2000
Training Seminar, NEC Birmingham

For further details please contact
National Society for Clean Air and Environmental Protection
136 North Street - Brighton BN1 1RG
Tel: 01273 326313 Fax: 01273 735802